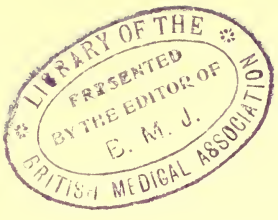
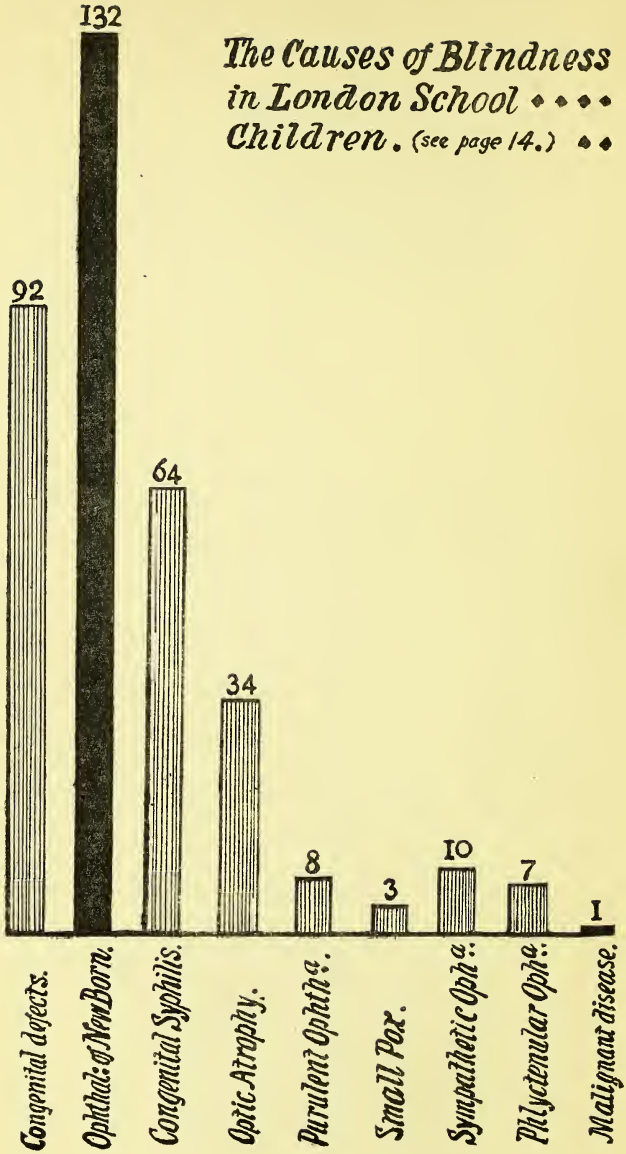
PREVENTABLE BLINDNESS

BY

N. BISHOP HARMAN

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Ophthal: of New Born.
Congenital Syphilis.
Optic Atrophy.
Purulent Ophth.a.
Small Pox.
Sympathetic Oph.a
Phlyctenular Oph.a.
Malignant disease.

PREVENTABLE BLINDNESS

AN ACCOUNT OF THE DISEASE KNOWN AS THE OPHTHALMIA OF THE NEW-BORN, AND OF ITS EFFECTS; WITH A PLEA FOR ITS SUPPRESSION

BY

N. BISHOP HARMAN

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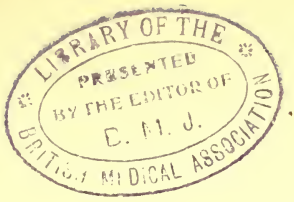
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'The great end of life is not knowledge, but action.'

HUXLEY.



PREFACE

In these pages I have sought to set out in a fair and consecutive order an account of a disease of the utmost interest, as much from the point of view of the social economist as from that of the surgeon.

In the narrative there is no feature of novel character to be emphasized; all that I have noted of my own observations can be paralleled by those of all who have studied the disease. The whole narrative is in the nature of cumulative evidence to enforce the necessity for action by the State.

To-day earnest efforts are being made in many directions to improve the chances of happy and successful life for the coming generation; but nothing has been done to reduce the incidence of a preventable disease which produces **more than one-third of the blindness found amongst school-children.**

Many schemes for the reduction of this preventable disease have been put forward—

education, compulsory notification, compulsory prophylaxis. To judge by much of our medical literature, it would appear the last of these is most favoured by our profession. To me it seems an impossible and also an undesirable proposition; but, as will be seen from the pages of this work, in the second proposition—compulsory notification—there appears at once a mode of attack on the disease likely to prove successful and one that is already well within the provisions of laws now in force.

With the extension of employers' liability there is, for those suffering physical disability, an increasing difficulty in earning a livelihood. Blindness is a disability of the heaviest order, and its prevention demands our utmost endeavour.

N. BISHOP HARMAN.

108, Harley Street, London, W.,
September, 1907.



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PREVENTABLE BLINDNESS

HISTORICAL

Considering the large number of references in ancient literature to the blind, and the universal appreciation of the loss blindness entails upon a man, it is remarkable that such small notice is made of the causes producing the blindness or the time of life at which the loss of sight occurs.

If in our times, when a growth in knowledge has brought about an increase in cleanliness and of precautions against disease, there are still to be found amongst blind children a full third of the cases blinded from infection at birth, we wonder what was the state of affairs in medieval and in classical times. Was the disease unknown, or were there conditions in the social arrangements of the times which tended to obscure the peculiar nature of such a disorder? What may be the antiquity of the

disease we are unable to determine. The knowledge of its connexion with venereal disease is quite recent. Even that knowledge does not help us, for until far into the eighteenth century syphilis and gonorrhœa were thought to be manifestations of the same disease. John Hunter maintained this in his 'Treatise on the Venereal Disease,' 1786. Even the work of Benjamin Bell in 1792, proving that there were two distinct diseases, did not establish the matter until confirmed by the elaborate experiments of Ricord in 1838. So from the examination of the literature of venereal disease, or historical records believed to indicate the existence of these diseases, we gain little.

The general silence of ancient literature on this cause of blindness is, I am inclined to think, due to social custom veiling the conditions under which the disease appears. The time of childbirth was formerly a period of rigorous seclusion for the mother, sometimes from motives of mystery, sometimes by reason of an implied or expressed ceremonial uncleanness. In the Levitical code there are a series of precise enactments which ensure the separation of a lying-in woman from the general current of life. She is unclean—'she shall

touch no hallowed thing, nor come into the sanctuary'—and it is clear from the general view of 'uncleanness' in that code that all who touch the woman are similarly unclean. The seclusion was well enough for the mother's health, but the widening of the circle of uncleanness, with the penalties attached thereto, ensured the shutting off from general observation the early days of childhood and a low grade of social standing in those who practised the art of midwifery. That this result did follow is, I think, demonstrated by the code itself; for although it contains minute and precise prescriptions on all manner of social matters, both sanitary and moral, yet not one word is to be found on so important a subject as the care of a baby. In such times to be born blind would imply to the general populace no more than the words tell—an unhappy wight, cursed from his birth by 'an act of God,' a matter not to be inquired into.

In the Levitical code (Lev. xxi. 20) is a passage prohibiting those who have a blemish—literally, spots or stains—in the eye from priestly service. The Vulgate translates the passage: 'Albuginem habens in oculo.' In the Gospel of St. John (ix. 1) is a reference to a man blind from his birth. There are many references to

blindness in classical writings. Cicero ('Tusculans,' v. 111-115) gives a number of instances to show that blindness is not so great an evil to persons who know how to use their minds. Most of those quoted as blind seem to have lost their sight at full age. Plato ('Republic,' 353) speaks of the function of 'virtue' of the eyes, which is replaced by a 'vice' when blindness occurs.

Perhaps the reference most nearly indicating ophthalmia neonatorum is one in Pliny ('Naturalis Historia,' xi. 27, 55, par. 149, Sillig's edition, 1852):

'Some men have been blind from their birth' (literally, 'have been denied vision immediately on birth') 'through no defect of the eyes; many have been suddenly deprived of it in a similar way, though no injury had preceded. . . .'

Then, in par. 150:

'Those born with the sight of only one eye are called "coclites," those with both eyes small are called "ocillæ." The name "luscini" connotes an injury to the eye.'

When we are considering the occurrence of blindness from this disease in Eastern countries, we have to bear in mind the exceedingly high death-rate amongst infants—a rate which seems,

from inquiries I have made amongst those who have had long experience of the East, to be altogether beyond the worst returns found in our country. A high death-rate may well account for the disappearance of blinded children, and perhaps also explain such a remarkable statement as that of Meyerhof of Cairo. In his paper on 'Acute Purulent Conjunctivitis in Egypt' (*Klin. Mon. für Augenh.*, September, 1905) he says that in eighty cases of gonorrhœal ophthalmia in adults he found Neisser's coccus without exception. He remarks on the great tenacity of the organism for affected tissues, and the ease with which it is demonstrated in apparently old cases of trachoma. Yet he was never able to find the organism in the new-born, and he found that ophthalmia of the new-born was rare in the lying-in hospital, although Credé's method is not practised. So far as he knew, the native women appear to take no special care of their infants' eyes, save that frequently onion-juice is instilled, or a scale of an onion is applied as a pad to the eyes. Recently I questioned a surgeon who had worked in the Jerusalem eye hospital. He confirmed the exceptional rarity of ophthalmia neonatorum, notwithstanding the frequency of adult gonorrhœal ophthalmia.

When we come to more recent times we find frequent references in medical literature to inflammatory affections of the eyes of the newborn, and speculations into the nature of the affection and its cause. Works as recent as John Arbuthnot's 'Ophthalmographia,' London, 1713, do not mention the disease, or anything suggestive of a knowledge of it.

But James Ware, surgeon, in his 'Remarks on Ophthalmy, Psorophthalmy, and Purulent Eye,' London, 1780, gives a very good clinical picture of the disease, with detailed notes of cases he had under his care. On the origin of the disease he writes: 'The purulent eye is usually unconnected with any other disorder, and is supposed to arise from the child's being imprudently exposed to cold air.'

William Rowley, in 'A Treatise on One Hundred and Eighteen Principal Diseases of the Eyes,' London, 1790, had not the faintest notion of the disease. He had a case under his care, but completely failed to understand it. He physicked the mother and complacently let the child go blind, and congratulated himself on the brilliance of his achievement.

At the commencement of the nineteenth century a new spirit of investigation had been infused into the study of these inflammations

by the occurrence of the epidemics of ophthalmia amongst the troops serving in Egypt. Scarpa, writing in Italy in 1804, notes the similarity of the purulent ophthalmia of the new-born and gonorrhœal ophthalmia; and John Vetch, a British army surgeon, in a most excellent monograph on the ophthalmia prevalent in the British army, London, 1807, writes: 'In external appearances the disease amongst the troops bears a strong resemblance to the affection Mr. Ware has described with much accuracy as peculiar to children.' And in the same work he states his belief, and supports it with proofs that remain good to this day, that there was a contagion which produced in the same man a succession of gonorrhœal urethritis, purulent ophthalmia, arthritis, and iritis.

In 1830 Mackenzie had learned so much that he could write:

'We have reason to believe that this disease is, in general, an inoculation of the conjunctiva with leucorrhœal fluid during parturition; and that, therefore, it may be prevented in almost all cases by carefully washing the eyes of the infant with tepid water as soon as it is removed from the mother. This is too seldom attended to: the child is allowed to open its eyes, the nurse sitting down with it on a low seat before the fire, or in a draught of cold air from the

door, and nothing is done to the child perhaps for half an hour or longer. Exposure to the light, to the heat of the fire, or to the cold draught from the door, are all likely enough injuriously to excite the eyes of the new-born infant; and accordingly some have been led to attribute the purulent ophthalmia which so frequently shows itself about the third day after birth to these causes. It will, in general, be found, however, that when the child becomes affected with this ophthalmia, the mother has had leucorrhœa before and at parturition, and that the eyes have not been cleaned for some time after birth. To this the ophthalmia seems to be owing; for, like a disease communicated by contagion, it is sudden in its attack, and much more violent than we almost ever see catarrhal ophthalmia, so that it resembles in this respect the Egyptian or the gonorrhœal inflammation of the conjunctiva. That some of the cases of purulent ophthalmia in infants are catarrhal, is by no means unlikely; occasionally they may arise from the application even of gonorrhœal matter from the mother, but by far the greater number I believe to be the consequences of leucorrhœal inoculation.'

And again:

'It is melancholy to reflect on the frequency of destroyed vision from this disease, especially as the complaint is completely within control if properly treated. The attendants are not

alarmed sufficiently early by what they consider as merely a little matter running from the eye, and but too often it happens that medical practitioners are also betrayed into the false supposition that there is nothing dangerous in the complaint till the corneæ burst and the eyes are for ever destroyed.'

Yet even after such a clear exposition of the liabilities of infants to infection, accidental or maternal, Stellwag, in 1867, referring to Mackenzie's views on infection from the vagina, writes :

'This is certainly not a very frequent cause of purulent ophthalmia. The eyes of the child are closed during parturition, and sealed with fatty material, hence inoculation is scarcely possible.'

Wanting a specific infecting cause, the difficulties of our forefathers must have been immense, and the difficulties make such observations as those of Mackenzie the more admirable.

The completeness of the clinical entity was only obtained by the discovery of the micrococcus of gonorrhœa by Neisser in 1879, and the determination that, by all the tests that could be applied by the microscope and by selective staining, the organism found in the

discharge of urethral gonorrhœa and in these purulent affections of the eyes was one and the same. That discovery marked the beginning of a new era in the treatment of the disease. Attention was no longer directed solely to the mitigation of the ravages of the disease in those affected, but to the prevention of its occurrence.

The rapid sequence of the adoption of preventive measures to the demonstration of the true nature of the disease is one of the most striking and effective testimonies to the value of bacteriology and experimental research to be found in modern medicine. It remains with us to find how far we can give completeness to the work already done by the public spirit and private energy of the medical profession, by obtaining such prescriptions of rule and custom by the Legislature as shall ensure the adoption of measures that have already been shown to be of benefit in reducing the disease and its terrible consequences.

THE CAUSES OF BLINDNESS

In the decennial census returns of England and Wales account is taken of the number of blind. In 1891 the number of persons so afflicted was 23,467 persons, and in 1901 the total was 25,317 persons. Of these the number of those blind from childhood form nearly one-sixth, for there were so returned 4,005 in 1891 and 4,621 in 1901.

If we compare the number of the blind with the total population in England and Wales, we find, in a population of 32,527,843 souls in 1901, 1 person in every 1,284 was blind, and 1 person in every 7,039 was blind from childhood.

Of those blind from childhood it is, of course, not possible to say to what cause the blindness is to be attributed; but anyone with experience of blind schools, where these children first come under critical examination, will agree without hesitation that, at the very lowest computation, one-third of them were blinded by ophthalmia neonatorum. This means that in 1901 there were living 1,000 to 2,000 persons whose blindness might have been prevented.

The total blind from childhood under fifteen years of age number 1,730. The children on the roll of the London County Council blind schools average 250, or one-seventh of the number returned for the Country. So these schools would seem representative, for the population of London is about one-seventh that of the Country—4,536,541 to 32,527,843; taking children under fourteen years of age only, the proportion is again about one-seventh, London being 1,273,475, and the Country 9,877,966.

Ophthalmia neonatorum bulks largely in our minds, not because it is exceedingly common amongst us, but because its consequences may be, and very frequently are, extremely serious, blindness, or partial blindness, being too often the result of an attack.

For the last five years I have had charge of the schools for the blind established by the School Board for London, and now maintained by the London County Council. In 1905 I published a detailed account of the causes of blindness in 255 children whom I had seen in the two preceding years. Of these, 94 children, or 36·86 per cent., were blinded at birth by purulent ophthalmia—that is, more than one-third of the blindness amongst these school-children was due to this one cause. In 1905 and 1906 the number of new scholars amounted

Census Returns (England and Wales), 1901

Sex.	1891.	1901	Condition as to Marriage, 1901.	Ages, 1901. Total.	Under 5.	5 to 10.	10 to 15.	15 to 20.	20 to 25.	25 to 35.	35 to 45.	45 to 55.	55 to 65.	65 to 75.	75 to 85.	85 and over.
	The Blind.															
M.	12·281	13·136	Single	5583	280	373	590	611	573	949	747	553	439	290	151	27
			Married	5360	—	—	—	—	30	372	854	1133	1262	1053	576	80
			Widowed	2193	—	—	—	—	—	8	55	157	417	658	685	213
F.	11·186	12·181	Single	5563	201	296	488	455	503	863	709	621	532	466	335	94
			Married	2525	—	—	—	1	14	181	322	525	636	60	257	29
			Widowed	4093	—	—	—	—	—	13	63	239	624	1262	1439	453
Total	23·467	25·317														
	Blind (Included in	*from* above.)	*Childhood.*													
M.	2·194	2·468	Single	2028	280	373	216	264	220	310	185	81	57	31	11	—
			Married	389	—	—	—	—	7	89	110	91	61	23	7	1
			Widowed	51	—	—	—	—	—	—	10	11	12	9	8	1
F.	1·811	2·153	Single	1954	201	296	164	188	192	332	217	178	99	56	26	5
			Married	143	—	—	—	1	6	41	37	37	14	7	—	—
			Widowed	56	—	—	—	—	—	—	7	10	21	12	5	1
Total	4·005	4·621														

to 108, so that in the four years I have examined 363 children,* and careful and repeated examination, with inquiry into their family history, gave the following as the causation and proportion of the blindness amongst them :

Disease.		No. of Cases.	Per-centage.
Ophthalmia neonatorum		132	36·36
Congenital syphilis :			
Interstitial keratitis ...	26		
Uveal and optic atrophy, etc.	38	64	17·60
Optic atrophy, various causes ...		34	9·36
Macula damage		5	1·38
Retinitis pigmentosa		5	1·38
Purulent ophthalmia		8	2·20
Small-pox		3	0·82
Sympathetic ophthalmia		10	2·75
Trachoma		2	0·55
Phlyctenular keratitis		7	1·95
Congenital defects :			
Cataract	29		
High myopia	22		
Microphthalmia	18		
Hypermetropia	3		
Buphthalmia	6		
Dislocated lens	3	92	25·34
Albinism	1		
Colobomata uveæ ...	2		
Ill-shaped heads	6		
Hydrocephalus	1		
Cerebral blindness ...	1		
Malignant disease		1	0·27
Total		363	100·00

* Whilst in the press a further 36 blind children have been seen, making a total of 399.

At the head of the list is the huge total of 132 cases, or 36·36 per cent. of the blindness, arising from the ophthalmia of the new-born. Great as this percentage is, it is in reality greater, for, by careful attention and operation, some of the cases which figure in the list under other headings have been relieved to such an extent that they will escape from the category of blind; and then, by the exigency of official arrangements, the high myopes, who are not blind, but for whom an ordinary elementary school curriculum would be injurious, are collected in these schools. If all those who, in later years, would pass as bad-sighted and not blind were eliminated, the percentage of blindness from ophthalmia neonatorum would exceed 40 per cent.

Contrast with this the blindness resulting from severe purulent inflammations occurring in the later years of life: there are only eight cases, or, if we include those blinded by small-pox, we get eleven cases, or 3 per cent. of the total.

Fuchs, in his 'Essay on the Causes of Blindness,' gives the following collection of statistics, gathered by various workers, of blindness produced by ophthalmia neonatorum amongst the pupils of blind asylums:

		Per Cent.
Reinhard ...	Germany, Austria, Denmark, Holland	40
Claisse	Paris	46
Magnus ...	Breslau	34
Katz	Berlin	41

Compare with L.C.C. blind schools ... 36·36

THE INCIDENCE OF OPHTHALMIA NEONATORUM.

It is not easy to arrive at any estimate of the number of infants affected by the disease in the course of any period. The matter is one concerning which any collective investigation is difficult without legal compulsion. Professional etiquette precludes the publication of cases by private practitioners, except when they are veiled by the impersonal statistics of hospital practice; but I shall be able to give the results of a personal inquiry amongst private practitioners, the results of the examination of the greater number of London school-children, and some hospital statistics.

In the estimation of the incidence of the disease from hospital figures there is always the difficulty—at least, in great cities like London—that the area from which a given hospital draws its patients is not defined; yet such statistics are valuable when they are taken for a sufficiently lengthy period of time, and when we can determine that the population of

the district in which the hospital is situated has remained of much the same character ; further, birth-rate fluctuations must be taken into account. All hospitals show an increase in patients in recent years, so an increase in any order of cases may mean little, but a decline in such cases as ophthalmia neonatorum would be noteworthy.

These cases are more often hospital patients than not, for they are by far the most frequently found amongst the very poor, and the nature of the treatment required causes them to be transferred to a hospital even when they apply to their own practitioners in the first instance.

There is a considerable body of statistics showing the incidence of the disease and the proportion the cases bear to the total cases in eye clinics. Their value depends upon the character of the clinics whence they are obtained, what the social standing of the average patient is, and whether or no the number of patients attending during a series of years is stationary, and whether the number of cases of young children under twelve months of age who are brought to the hospital bear a constant proportion to the total.

I have examined the case-papers* of children

* For the use of these my thanks are due to Mr. Lang.

who have come under treatment for this disease at the Middlesex Hospital for the last twenty years. During this period there has been a steady decline in their number by whatever means of comparison they be judged—whether in the actual number of cases each year; or in their relation to the total number of eye patients; or, what is a much fairer standard of comparison, in their proportion to the number of infants under twelve months old who have been brought to the hospital. In the first four years of this period there were 83 cases, or an average of 21 cases a year; in the last four years only 20 cases occurred, or an average of 5 each year. But during this period the ophthalmic out-patient department of the hospital has increased largely. In 1888 there were about 1,200 new patients, but since that time the number has risen until now it exceeds 2,000 a year.

The proportion which the ophthalmia neonatorum cases would be to the total case incidence will therefore show a startling alteration. In the first four years, the period of heaviest incidence, the percentage is 1·05, and in the last four years, the period of lightest incidence, only 0·25 per cent. of the total eye cases.

These figures would be eloquent were the

proportion of infants under twelve months constant throughout these years, but they are not. The increase in the total case incidence has been largely due to the greater number of refraction cases, especially amongst school-children. The baby patients have actually declined in number from an average of 50 a year during 1888 to 1903 to 20 a year during 1903 to 1906, or from 2·6 per cent. of the total cases to 1·15 per cent. This decrease is paralleled by the decrease in the birth-rate of the district of All Souls, Marylebone, in which the hospital stands. In 1885 it was 20·5 per thousand, in 1895 19·5, and in 1905 15·4 per thousand inhabitants. The decline is due to the displacement of small houses by blocks of flats, but the social status of the remaining child-bearing inhabitants has not improved—rather the reverse.

If we neglect the proportion of these cases to the total case incidence, and take the proportion they bear to the infant patients under twelve months old, we shall get a perfectly reliable and sound basis of comparison. Birth-rate will not matter ; only social status will influence the result ; and this, I have said, has not improved.

By this mode of comparison we find cases of

ophthalmia neonatorum in 1888 to 1892 form 39 per cent. of the children under twelve months, but in the years 1903 to 1906 they form only 23 per cent. For this district, then, there is a real diminution in the incidence of the disease, and it is a diminution which must, I think, be put to the credit of the doctors, midwives, and other attendants of the lying-in women, and the greater care and knowledge they bring to their work.

I have examined the available records of births in the extern department of the hospital. The cases are attended by students of the hospital under the direction of the obstetric house physician. In all cases either Credé's method of prophylaxis or perchloride of mercury lotion is used for the child's eyes after cleansing. In rather more than two years there were 700 births. Amongst these there were 12 cases of slight conjunctivitis or gumminess of the eyelids without pus, and there were 4 cases of purulent conjunctivitis; but all were slight, and speedily cleared up under treatment. The proportion of these cases works out at 0·57 per cent.

There was one case of purulent conjunctivitis which commenced on the tenth day of life. It was a severe case, and came under my care.

The parents were foreigners of the dirtiest and most ignorant type. If this case be included amongst the others, the incidence of ophthalmia neonatorum in the external midwifery practice of the hospital was only 0·7 per cent.

The returns from the eye clinic of the hospital are satisfactory in their tendency, but the decrease does not extend to the country as a whole. In the figures given in the decennial census of those blind from childhood there is an increase. In 1891 the proportion to the then population was one blind in every 7,241 of the population. In 1901 there was one blind in every 7,039 persons.

Recently in the *British Medical Journal* a report from a Liverpool hospital was given which showed that these cases were so numerous that the ordinary operative work of the children's eye ward was entirely suspended, since the beds were occupied with these cases.

In small cities it is much more possible to arrive at the incidence of the disease. Cohn, in evidence before the Commission of the Schleswig Association in 1895, stated that in Breslau the previous year 12,000 children were born. Of these, 250, or 2 per cent., were affected, and almost all were seen in hospital. He considered they bore a relation to the total

cases attending the eye clinics of from 0·5 to 1·2 per cent. Silex of Berlin found in the University Clinic these cases bore a proportion to the total case incidence of 1·1 per cent.

In the course of my work amongst the children in the London elementary schools I have made special note of the eye conditions amongst them. During 1903 to 1904 I examined 22,000 children in the East of London in the districts of Hackney. This includes such poor districts as Hoxton and Bethnal Green and the better regions of Clapton. Amongst these children I found five with eyes damaged by ophthalmia neonatorum. In 1905 to 1906 I have examined in the same manner 18,000 children in the West of London in the Marylebone district, and amongst these I only found two cases of eyes so damaged. The percentage of damaged eyes amongst these two groups of 40,000 children was 0·017 per cent.

This year I have examined the vision-testing returns of my colleagues in this school-work. The returns covered 412,527 children, a huge total. Amongst these children there were 46 cases of damaged eyes of a sort which appeared to be due to the result of early purulent ophthalmia. In many cases the history was clear

and the diagnosis certain, but in others the condition of the eyes was all there was to go upon. So amongst 412,500 school-children the proportion of children showing signs of this disease was 0·0106 per cent.

The London school-children number about 790,000 under fourteen years of age. Supposing the incidence be considered the same for this total as for the 412,500, there would be altogether 88 cases in the schools. In the blind schools of the Council are an average of 92 cases on the books under sixteen years of age who are withdrawn from the ordinary elementary schools on account of this blindness. So the total for the London elementary schools will be 180, or 0·0226 per cent.; or one child in every 4,400 had ophthalmia neonatorum of such severity that the eyes received serious and permanent damage, and more often than not the child was blinded. As I shall show later, of those cases of undoubted ophthalmia neonatorum seen at hospital, whether brought early in the disease when treatment has a fair chance, or later when the eyes are already damaged, 69 per cent. escaped without injury to the cornea. So the 180 school cases represent only 31 per cent. of a group of children who suffered from this disease.

Almost all observers agree that the disease is much more frequent amongst the very poor and neglected than amongst all the rest of the community combined. My experience at the Belgrave Hospital for children is a good commentary on this opinion. For ten years the hospital was situated in Pimlico, a poor and circumscribed area between the River Thames, a canal, and large railway-sidings. In that time 1,800 eye patients were seen. Of these, 128 were under twelve months, and 58 were cases of purulent ophthalmia, 44 occurring at birth. Counting only these 44 as true ophthalmia neonatorum, we have 34·4 per cent. of the infants under twelve months affected with the disease. At the new hospital built in Kennington patients are more numerous, but of a better class. In a little over three years there have been 1,120 cases. Of these, 48 were under twelve months, and amongst them were only three cases of ophthalmia neonatorum, or only 6·2 per cent.

The figures I have given from the Middlesex Hospital and from London County Council schools are valuable as far as they go, but they do not give sufficient data on which to estimate the incidence of the disease. To get some better means of estimating this, I selected an

average district in London, a suburb containing a fair average of London population. The practice in the district would be known as 'mixed.' Half the population live in tenements, the other half in houses rented at from £30 to £80 per annum, but there are few at the higher rental. At the lowest estimate, three-quarters of the children living in the district attend public elementary schools. I saw many of the doctors in private practice in this neighbourhood, and inquired of their experiences of purulent ophthalmia in the new-born. Eight doctors responded, giving account of some 12,680 births. Of these eight doctors, seven relied upon the simple precaution of cleansing the eyes of the infant with boiled water or boracic lotion, a few said in children born of suspicious mothers a weak perchloride lotion would be used, and one doctor used silver nitrate of 2 per cent. in almost all cases as a prophylactic.

Amongst 9,680 births where no germicide was used as a routine prophylactic there were 70 cases of purulent discharge occurring within the first few days of birth, or in 0·72 per cent. In 4 cases eyes were lost or damaged. One child had corneal nebulæ, one lost one eye, and two lost both eyes. These damages

make an injury rate of 5·7 per cent. of the affected children, or 0·041 per cent. of the total births.

Amongst the 3,000 births where silver nitrate was used as a routine prophylactic immediately after birth, there were 37 cases of slight purulent discharge and 3 cases of well-marked gonorrhœal ophthalmia. Of these three, one was cured undamaged, one lost one eye, the third lost both.

Taking the whole 12,680 births, we find 110 cases wherein some purulent discharge of slight or severe character was found after birth, or 0·87 per cent. Amongst these affected children the injured numbered 6, or an injury rate of 5·4 per cent., or 0·047 per cent. of the total births.

It will be interesting to compare these returns with those I obtained from the Council schools.

	Children.	Injured.	Total of Purulent Cases.
Private practice in London	12,680	6 = 0·047% (1 in 2,100)	110 = 0·87%
L.C.C. schools	790,000	180 = 0·0226% (1 in 4,400)	—

It will be noticed that the proportion of blindness, or partial blindness, produced by the disease and given in the figures obtained from

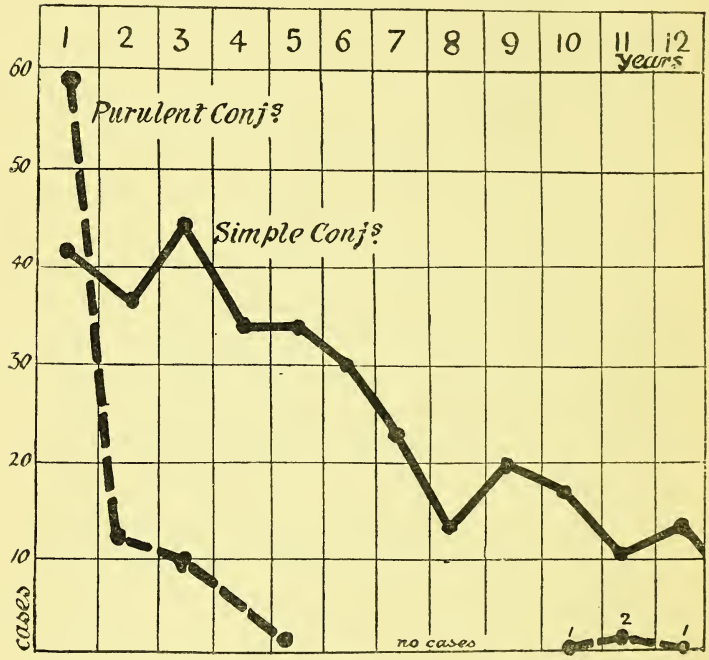


FIG. 1.—CONTRASTING THE INCIDENCE OF PURULENT INFLAMMATION AND SIMPLE CATARRH.

Of the purulent cases, 76 per cent. occurred at birth. (Belgrave Hospital, ten years.)

private practice is double that obtained by the examination of London school-children. The difference will be accounted for when we re-

member the high death-rate amongst children in the first year of life : the census returns a greater number alive under one year than between one and two years by many thousands. This death-

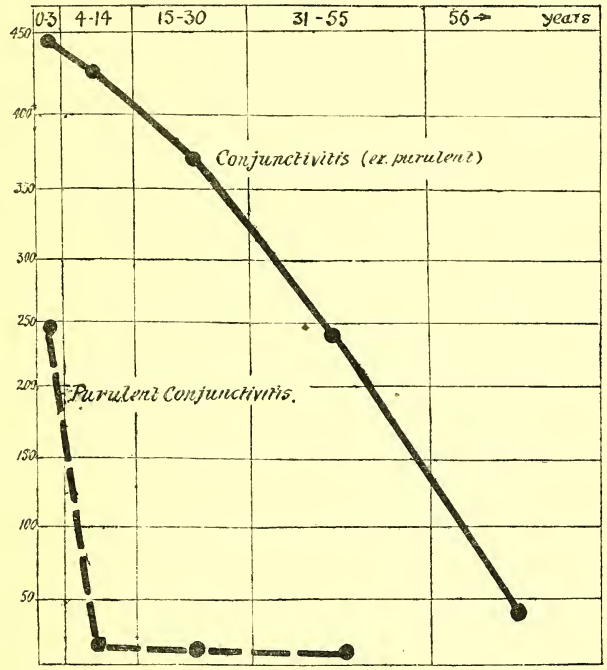


FIG. 2.—THE COMPARISON OF THE INCIDENCE OF PURULENT AND NON-PURULENT CONJUNCTIVITIS.

The ages are grouped. (Moorfields, one year.)

rate should particularly affect these blind children, for Lobenstine and Harrar (*Bulletin of the Lying-in Hospital, New York*, December,

1906) have shown that infants born of gonorrhœal mothers are less viable than those born of healthy mothers. Then the school figures are smaller than they should be, owing to the difficulty of establishing a diagnosis in the absence of a reliable history.

These figures point to the conclusion that, in London, amongst every 100 children born, one child suffers from purulent inflammation of the eyes in the first few days of life, and that, of every 2,000 children born, one child is blinded or partially blinded by this disease.

CLINICAL CHARACTERS OF THE DISEASE

The eyes of every new-born babe are clean and wholesome. In every child just born this is the rule; exceptions to the rule are of extreme rarity. But in not a few cases within a comparatively few hours from the birth of the child the surfaces of the eye and its covering, the conjunctiva, become inflamed; the clean, shining mucous lining of the lids and the globe become red, engorged with blood, and bathed with pus; the clear transparency of the front of the eye is threatened with disorder, and too often it succumbs, and the clear eye of the babe becomes for life a white, misshapen, sightless mass, an object of loathing to those who see it.

The eyes of a young child are as liable as those of an older child or an adult to be contaminated with any septic material that may be conveyed to them—indeed, they are rather more liable, for the lachrymal secretion is not

established for from fourteen to twenty-one days from birth, so their eyes lose the wash of the tears. But they sustain a peculiar liability to contamination at the time of birth, for during that process the face and eyelids of the infant

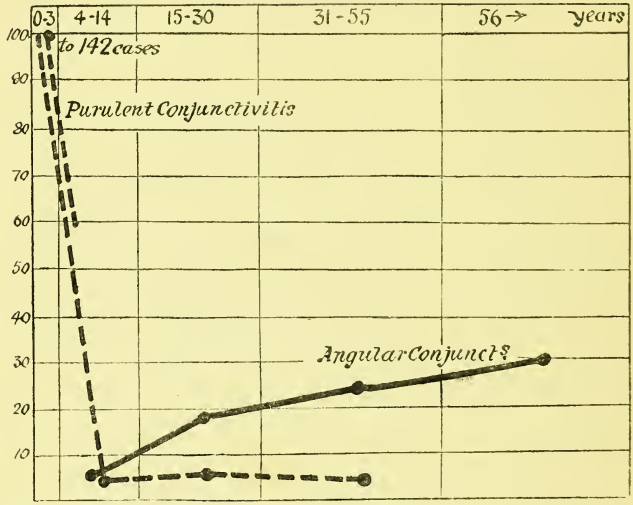


FIG. 3.—CONTRASTING THE INCIDENCE OF TWO CONJUNCTIVAL INFLAMMATIONS DUE TO DEFINITE INFECTIONS.

Purulent inflammation nearly all at birth, and the affection produced by the Morax-Axenfeld bacillus mainly in later years. (Moorfields, one year.)

are brought into contact with large mucous surfaces for a long time, and in a manner in which they are never likely to be brought for the remainder of the life of the individual.

To our forefathers, to whom micro-organisms were unknown, there was a nice balance of probabilities: was the occurrence of this disease due to accidental causes such as men are liable to at any period of life, or was there some special liability to infection at birth? In reading the works of men who wrote 130 years ago, we see how difficult must have been the problem. Some, with rare acumen, saw the likeness of the discharge of a urethral gonorrhœa to the discharge of an acute purulent ophthalmia in an adult, and opined, as did Vetch in his excellent work, that the same cause produced both conditions. Some saw such a likeness between the severe ophthalmia of adults and the ophthalmia of the new-born that they conceived they must be allied, if not the same, seeing that many women at the time of delivery suffered from vaginal discharges like to that of gonorrhœa.

Nowadays amongst children under twelve months old brought to hospital, the majority suffer from some inflammation of the eyes. Amongst Middlesex patients I find 85·5 per cent. were suffering from varieties of conjunctivitis. At the Belgrave I find the proportion to be 79·5 per cent. Of these cases of conjunctivitis more than one-third were cases of ophthalmia neonatorum.

To us, ophthalmia neonatorum means for the most part a definite disease produced by a definite organism, the gonococcus of Neisser. There are many cases of inflammation occurring in the early days of life, produced by accidental contamination of the eyes by organisms, but unconnected with the incident of birth; these inflammations may simulate in some degree the true ophthalmia of the new-born, but it is rarely such cannot be detected by clinical examination alone, while to the test of the microscope the differentiation is conclusive. To most, then, the term ophthalmia neonatorum connotes a purulent conjunctivitis due to a gonorrhœal infection of the eyes at the time of or near to birth, and it is to this entity our real interest is directed.

The features of the purulent catarrh produced by the gonococcus are so characteristic in infants that the earliest recorded descriptions, such as those by Ware, in 1780, are as clear a picture of the condition as any that could be written to-day. The soft, elastic nature of the tissues of an infant's eyelids allows of marked swelling, and this feature has been always commented upon by observers.

In the majority of cases the disease commences on the second or third day of life.

There is a little redness about the inner angle of the eyes. Tears, which should be unknown at this early age, are shed; but, unlike normal tears, they speedily dry on the surface, glueing the edges of the lids together, or more often the edge of the upper lid on to the skin surface of the lower. The lids are a little glassy-looking; their finer folds are lost, the grosser folds a little exaggerated; when the eyelids are separated tears gush out; the conjunctiva is found to be red; and little flecks of mucus are seen in the lacus lacrimalis. Within a very few hours this rather unsuspicious-looking catarrh becomes a fully-developed purulent inflammation.

It is rarely we see a case in this early condition. Almost always the child is brought to a hospital with a fully developed purulent catarrh of more or less severity. The upper lids are full and purplish tinted; they bulge over the lower lids, and their edges are glued down with a thick yellowish discharge. When we remove this crusted matter and open the lids, the conjunctiva is found to be red, rough, and villous, and covered with a thin creamy pus. If all cases were seen and came under treatment at this stage, there would be few cases of blindness ensuing; but too often cases are

brought to hospital when the inflammation has run on for days and weeks, and from between the lids there wells up thick yellow or greenish pus, streaked with blood at the least movement of the lids; and with the cry of the child the engorged and swollen lids are everted, and the villous and bleeding mucous surfaces exposed to view. In these circumstances we too often find the cornea irretrievably damaged.

Cases vary much in severity. Under efficient treatment some are uncomplicated cases of purulent catarrh, and the examination of the cornea from day to day shows it to be clear and bright. In others the swelling of the lids and the puffiness of the ocular conjunctiva are more marked, and in such there is frequently at an early stage a dimming of the cornea. Its surface is grey and rough, and in these cases complications from ulceration into the proper substance of the cornea is to be feared. In yet other cases there is a marked chemosis of the ocular conjunctiva, so that when the lids are parted and the cornea exposed, it is found to be surrounded by a wall-like fold of swollen conjunctiva, and the lower level of the cornea is filled with purulent fluid. In these cases we are happy if the cornea escapes serious damage.

But the chemosis is never of that severe order found in the gonorrhœal ophthalmia of the adult, where the intensity of the inflammation is such that there is poured out an exudate of so fibrinous a nature that it sometimes coagulates, making the swollen conjunctiva a stiff gelatinous mass. Swelling of the lids to such an extent that they are completely everted, after the fashion described so graphically by Rowley in the case of the foundling, are not common, and in some of these the eversion seems as much to depend on the vigour and lustiness of the child in screaming as on the greatness of the swelling. In some cases there is an adenitis of the preauricular gland, but I have never seen the inflammation proceed to suppuration.

A small number of cases develop symptoms similar to those found in membranous conjunctivitis. The inflammation is so acute that the surface epithelium is destroyed *en bloc*, and can be peeled off as a grey pellicle, leaving a red and bleeding surface. The cases are rare. I have only come across one, and it was not of a severe type. The membrane reformed several times during one week, but then ceased, and the case healed satisfactorily and uneventfully. In this case the *M. gonorrhœæ* was found.

Such a case as this, where there is a formation of a delicate membrane for a few days in the course of a purulent inflammation due to the *M. gonorrhœæ*, is to be distinguished from those severe cases of necrosis of the conjunctiva variously called diphtheritic or membranous conjunctivitis, and due to infection with the streptococcus or the diphtheria bacillus. In these latter cases the inflammation is of the most acute order, and the results often disastrous in the extreme. They are not common in children under twelve months of age. In my list are two cases, one in an infant of five weeks, the other of eleven months. Both were due to a diphtheria bacillus. I have published cases due to the streptococcus, but in older children. In a paper read before the British Medical Association at Cork, Mr. Nettleship dealt exhaustively with the subject. Most of the cases he collected were in elder children, but one noted by Hulme was in an infant of a week old, who, after purulent ophthalmia, developed a membranous condition of the upper lids, which persisted for several months. Recently Arnold Lawson detailed before the Ophthalmological Society a case of severe and disastrous membranous conjunctivitis, due to an infection with the *Streptococcus pyogenes*,

occurring in a child of seventeen days old. The eyes were lost. In Germany these cases appear to be more common than in England.

Such cases as these should not be classed with ophthalmia neonatorum, the result of inoculation with the *M. gonorrhœæ*. All children are equally liable to the infection, those recovering from the exanthemata more so than the new-born. They are much more acute: such an intensity of œdema and chemosis, so free and prolonged a sanious discharge as these present are never seen in the purulent inflammation of the new-born resulting from the gonococcus. And when film preparations from two such cases are brought to the test of the microscope, there can be no mistake between them.

The variability of the effects of the inoculation of the *M. gonorrhœæ* into the conjunctiva of children appears to depend upon the recentness of the genital infection of the mother. Inoculation from a recently acquired venereal disease commonly produces a much more intense conjunctivitis than does inoculation with an organism which has remained latent for more or less numerous generations in the maternal passages. The researches of Piringer,

which are referred to later, amply support this view.

In this connexion it is interesting to note that when there is an infection of one eye only, should the other eye be attacked at a later period during the treatment, the conjunctivitis in the secondary infection is usually much slighter.

In the majority of cases, however, both eyes are affected, and the degree of inflammation is such that little difference in the onset of the infection can be supposed. In 188 cases of which I have notes all were binocular save thirteen. And in some of these unilateral cases the cause of the inflammation was subsequently demonstrated to be a 'dirt' organism, and not the gonococcus.

Of the unilateral cases, ten were left-sided and three right-sided. The greater frequency of the affection of the left eye suggests the possibility of a connexion with the earlier birth of that eye, or its position in delivery, as might be produced by the relation of the very general left occipito-anterior head position to the usual lying-in position of British women; for in this position of birth the left eye would be for a longer time in the filth lodging on the mother's thigh than would the right. If

there is anything in this, Continental reports should show no difference in the frequency with which right and left eyes are affected alone, for there women are delivered dorso-cubitus.

THE RISKS OF PERMANENT INJURY

The cornea is the danger-point.

In purulent inflammation of the new-born in England danger is only to be feared when the gonococcus is the cause of the affection. In cases taken early and well treated the danger, save in a small percentage of the most virulent, is small; not treated, or treated badly, the risk to the cornea, and so to the vision, is serious.

In every case of conjunctivitis the conjunctival layer of the cornea, the anterior epithelium, is affected to some extent; in almost any film preparation of discharge some of the flattened surface cells may be found. In some cases the irregularities produced in the cornea can be demonstrated by staining with fluorescin, when delicately stained points of the roughened epithelium can be made out with a lens. This is peculiarly so in the infection of the new-born: the epithelium is thinner, and the gonococcus has a special facility in penetrating the

intercellular substance. In such cases large flakes, such as that drawn in Fig. 4, may be found in the discharge, and excavations or surface ulcers are formed.

But the danger is more than this : the nutrition of the cornea is affected by the œdema. The cornea depends for its vitality on the condition of the vascular loops of the limbus. In chemosis even of a mild degree the lymph-flow to and from the cornea is impeded or blocked, so that there is a stasis of the circulating fluids of the substantia propria. This process alone will account for those more serious and disastrous cases where the cornea is found to present a uniformly dull grey appearance ; for the interstitial stasis is followed by an engorgement with leucocytes, an abscess forms, and the cornea breaks down. In most cases, however, the attack on the cornea appears to proceed from without, and is helped by the disturbance of the nutrition of the proper substance. At all ordinary times the surface epithelium and Bowman's membrane serve to protect the cornea from invasion, but when the integrity of the epithelium is enfeebled or destroyed by the gonococcus, the ulcer penetrates the more easily by reason of the weakening of the proper substance of the cornea. Not

infrequently I have seen cases brought to hospital where this ulceration had extended to Descemet's membrane, so that in the depths of the ulcer a clear black spot was seen. When this stage has been reached perforation is certain and unavoidable.

The extent of the damage to the eye depends upon the manner in which the perforation has taken place. When there is a rapid disintegration of the cornea from an interstitial abscess, the perforation is gross, and in some such cases, not only is the whole of the free border of the iris prolapsed into the opening, but the lens may be expelled. When the ulcer is of slow formation and deepens slowly, the perforation is sometimes so small as to be filled with a very small prolapse of iris, and a delicate anterior synechia results. In such cases there is very frequently damage to the lens capsule, the loss of aqueous humour, and consequent juxtaposition of the granulating irido-corneal adhesion affect its nutrition, and granulations spring up within the capsule to form an anterior polar cataract.

Amongst the blind children of the London County Council schools it is possible to form a complete series of cases of the effects of perforation of the cornea. There are cases where iris and cornea are so matted by scar tissue that no

remnant of true corneal tissue remains: these eyes commonly bulge from the steady pressure of the aqueous humour, when the natural drainage through the spaces of Fontana is lost, and at later periods of life they not infrequently burst. From these hideous eyes there are all degrees: in some the large leucoma adherens, with no pupil, but some remnant of sound and clear cornea; cases of less degree, where some part of the free border of the iris has escaped inclusion and a more or less irregular pupil remains, but its opening is blocked by the fibrous plaque on the lens capsule; in others a leucoma adherens of the smallest size, and a minute polar cataract; in others the evidence of perforation only to be found in a barely perceptible nebula of the cornea and a minute polar cataract; and in yet a last where the ulceration has not proceeded to perforation, but has left its traces in a nebula of the cornea alone. In these last the evidence of a severe purulent ophthalmia would not be conclusive were it not that the other eye commonly shows a damage of more serious form.

In all these cases it is common to find traces of the severity of the affection in a permanent scarring of the conjunctiva of the lower lid and upper fornix, as fine bluish-white lines seaming

the tissue in rows parallel to the edges of the lids. They are due to the shrinkage of the granulation tissue formed by the invasion of plasma cells into the substance of the conjunctiva during the inflammation. In examining the eyes of children in schools, Stephenson found traces of this scar formation in eighty-two cases amongst 15,316 children, and the frequency was higher amongst the pauper class than amongst those of a higher social grade.

There is another form of permanent damage to the eye which may be referred to here: **the production of nystagmus.**

From my experience of children blinded by purulent inflammations at birth and at later periods of life, I find that nystagmus is very much more likely to be found amongst those blinded at birth. From observations on infants, I conclude that the fixation faculty is developed very early in life, as early as the third week, and it would seem that when the eyes are closed for a period of some weeks or months by a violent inflammation, and perhaps only open then with more or less opaque corneæ, the fixation faculty does not develop properly. It is only by some such conjecture as this I am able to account for the presence of nystagmus in children where the permanent damage to the

cornea of one eye is of the slightest; and yet there is a serious defect of vision, which cannot be accounted for by the condition of the media, or by any changes in the fundus.

Conditions not infrequently following on after ophthalmia are those known as **Xerosis** and **Keratomalacia.** The xerosis is always of the simpler epithelial type. I have notes of three cases, and in two of these keratomalacia was also present in a marked degree. The infants were small and ill-fed; the corneæ were dead white in colour, and soft and almost insensitive to touch; the conjunctivæ dry and lacking in sensitiveness; the fornices filled with rolls of dry, curdy material swarming with micro-organisms, the xerosis bacillus for the most part; and there was no secretion of tears. With these infants marasmus was probably a general cause, and the severity of the purulent inflammation, and perhaps the prolonged use of silver solutions, the local cause. The intrinsic mucus-secreting functions of the cells of the mucosa, and perhaps also the secretory functions of the lachrymal gland, were lost or in abeyance. In these infants the xerosis and keratomalacia speedily cleared up with improved general nutrition, promoted by the use of cod-liver oil, both by mouth and inunction, and by the local

application of drops of castor oil to the conjunctiva several times in the day.

Amongst the sequelæ of the disease is a somewhat rare constitutional change affecting the joints. In 1885 Mr. R. Clement Lucas drew attention to gonococcal joint disease occurring in infants secondary to purulent ophthalmia. Cases were subsequently recorded by Fendic in England, Debierre in France, Zatvornitski in Russia, and by Widmark in Germany. In 1899 Mr. Lucas had collected twenty cases. Of these, eighteen had been inoculated at birth, and five were secondary inoculations in older children, of whom the eldest was seven years of age. In the primary cases the ophthalmia generally appeared on the third day after birth, and the joint symptoms towards the end of the second or third week of the ophthalmia. The affection of the joints presented two forms: (1) An acute arthritis, with swelling, tenderness, and redness, suggestive of suppuration in the joint; (2) a subacute synovitis, with effusion and pain on movement, with but little or no redness. The left knee was most commonly affected, next the left wrist, but other joints might be attacked. After a duration of from three to five weeks resolution ensued. Bacterial examination of

the eyes and joint fluid proved the presence of the gonococcus, in some cases with streptococci and staphylococci also. Lucas concluded the early onset of the disease, and its rapid course precluded the possibility of a syphilitic origin.

THE CONTAGIOUSNESS OF THE DISEASE

EIGHTY per cent. of all the purulent inflammations of the eyes of new-born children are due to the *M. gonorrhœæ*, an organism of essentially parasitic nature, and easy of communication from man to man, either directly, or indirectly by discharges conveyed on clothes, towels, and the like. Of the remaining 20 per cent., at least half are due to the Koch-Weeks bacillus, which is almost as readily conveyed from man to man by the same means, but the risk to sight and health is small.

The readiness with which the discharges from the eyes of an infant suffering from ophthalmia of gonorrhœal origin may be conveyed to other children or to adults in the same household is well enough known, but not always borne in mind. I cannot better illustrate the danger which the cases give rise to, irrespective of the danger of loss of sight in the infant originally inoculated, than by detailing one case and

the series of secondary inoculations arising therefrom.

There came to Moorfields one day a family of mother, three girls—aged ten, eight, and four —and an infant of four weeks. The mother said she had had no vaginal discharge before giving birth to the child, but on the fourth day the infant developed severe purulent ophthalmia. The infant slept with her parents. A week later the youngest girl contracted the disease, and, since the three girls slept together, the other sisters were inoculated, the eight-year-old girl at the second week, and the eldest at the third week. At the fourth week, when the family came to hospital, the mother had the initial symptoms of an attack. Examination of the discharges from the eyes of these four children demonstrated the presence of *M. gonorrhœæ* in all, but no organism could be found in the case of the mother. Further it was found that each of the children suffered from a gonorrhœal vulvitis. Happily, efficient treatment resulted in complete recovery, and no eyes were lost.

Such a series of secondary infections as this demonstrates more forcibly than any argument the necessity for the segregation of infected infants, both for their own sakes and the safety of those with whom they live.

ANTEPARTUM INOCULATION

In a few cases children have been born with symptoms of purulent ophthalmia already developed. A good deal of discussion has been aroused by them.

In 1885 Friedenwald published a case which had come under his notice, and gave abstracts of twenty others he found recorded. In his case labour lasted two days; there was a face presentation, the membranes ruptured fifteen hours before delivery was effected. At birth the eyes were noticed to be swollen and closed, and there was muco-pus upon them. He considered the eyes had been inoculated by the finger of the midwife during an examination. Of the twenty cases he reviewed, in seven the membranes had ruptured forty-eight hours before birth, in three from fifteen to nineteen hours, in one eight hours, in another three hours, and in one shortly before birth; in the remaining seven cases this point was not noticed. In all these cases there was a large proportion of corneal

involvement; in one the eyes were completely destroyed. He considers the difficulty of the labour, the early rupture of the membranes, and consequent prolonged contact of the eyes with the poison, and the possibility of inoculation by the fingers of the midwife in difficult presentations, all tend to produce these cases.

Neiden, in 1891, published the case of a child born in the membranes. The eyes were cleansed with perchloride of mercury immediately on removal, yet it developed purulent ophthalmia in twenty-four hours.

Armargnac, in 1902, recorded the case of an eight-months child delivered after a labour of only one and a half hours, and three-quarters of an hour after the membranes ruptured. Immediately after birth the eyelids were noticed to be swollen, red and tense, and a drop of pus was seen to escape from between them. Pus was also seen coming from the vagina of the mother. The doctor saw the case an hour after birth. There was a purulent discharge, the cornea was white and macerated, and both eyes were a total loss. Two years later the same mother gave birth to another child, which developed ophthalmia neonatorum, and the mother was subsequently found to suffer from a chronic metritis.

Kraus of Vienna demonstrated the penetration of gonococci into the tissue of the uterus, where they gave rise to a specific metritis.

I have seen eyes damaged during birth, mostly where instrumental help was necessary, but in none of these did any signs of purulent catarrh develop. At one time, for the purposes of anatomical research, I received numerous stillborn children from Manchester and London, but in all these the eyes were uninjured.

The cases published by Friedenwald point to inoculation, and possibly injury, to the eyes during long and difficult labour. We can readily understand how easily the eyes would suffer in a prolonged contact with an infected vagina, especially with the congestion of the tissues such as a face presentation produces, and when manual aid is required to deliver the child.

The case of Armargnac is much more difficult of interpretation. None of these probable causes was present. The child was small, the labour easy, the membranes did not rupture unduly early; but the presence of pus in the maternal vagina points to a recent infection, and the researches of Piringer into the variability of the virulence of the *M. gonorrhœæ*, whether it is of recent contraction by the host or not,

supply a reasonable degree of probability for an inoculation of the child in the parturient canal. The suggestion of a possible inoculation *in utero* when there is a septic metritis seems difficult of acceptation. A septic metritis of gonorrhœal origin appears to be almost always associated with a similar affection of the Fallopian tubes, and it does not appear probable that conception would take place under these conditions. The association of sterility with gonorrhœal salpingitis is well known.

BACTERIOLOGY

EXCLUDING a large number of cases where film preparations of discharges from the eyes of infants have been examined in the course of clinical work, I have made, during the course of two years, detailed bacteriological examinations of the eyes of twenty-eight babies in whom there was some condition which caused their parents to bring them to hospital.

Of these, twenty-one cases were definitely purulent conjunctivitis. Thirteen occurred in the first few days of life, and from the examination of the eyes alone an unhesitating diagnosis of ophthalmia neonatorum due to the *M. gonorrhœæ* was made.

In four cases there was purulent discharge, but the characters were such that the diagnosis of 'ophthalmia neonatorum' (?), with a large note of interrogation beside the name, was made. There were features that did not conform to those belonging to an infection with the *M. gonorrhœæ*. Two were of conditions con-



FIG. 4.—A FILM PREPARATION FROM A CASE OF OPHTHALMIA OF THE NEW-BORN.

It shows well the intracellular character of the coccus. It was drawn because of the occurrence of an epithelial flake. The cement substance joining the cells is crowded with organisms. It demonstrates the power of penetration which these cocci have. (× 1,500.)

To face p. 56.

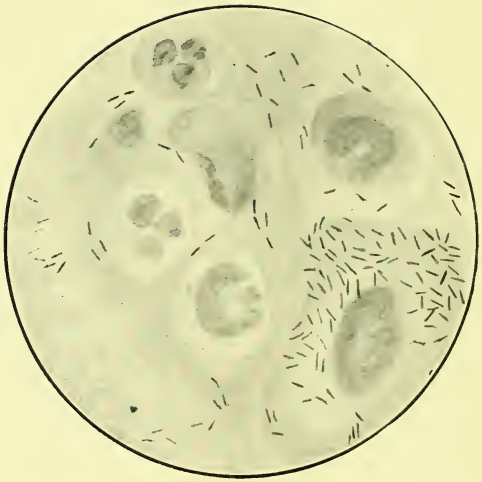


FIG. 5.—A FILM PREPARATION FROM A CASE OF MUCO-PURULENT DISCHARGE.

The secretion is crowded with Koch-Weeks bacilli. They are particularly numerous about the epithelial cells and cellular debris. (× 1,500.)

To face p. 57.

secutive to ophthalmia neonatorum. Three were purulent cases which occurred at the second, the fifth, and the sixth months of life, so there was no suggestion of a birth connexion.

Of the remaining six cases, two were cases of membranous conjunctivitis, and four of varying degrees of conjunctivitis of an irregular sort, but without puriform discharge.

The bacteriological investigation of this disease is at once most simple and most difficult. Some organisms can be recognized in film preparations with the greatest ease and with almost perfect certainty. The *M. gonorrhœæ* is one of these, and perhaps the one most easily demonstrated by appropriate staining. The enormous number of biscuit-shaped cocci present in films from pus of a gonorrhœal infection, the characteristic way in which they are crowded into the pus cells, even to as many as forty pair within a single cell, and the decolorization of the coccus when treated by Gram's method, are all for clinical purposes true and sufficient evidence.

But the isolation of the organism is a matter of great difficulty, both by reason of the essential parasitism of the coccus and on account of the presence of saprophytic cocci, which early gain

access to the eye, and by their rapid growth on the nutrient medium obscure the special coccus.

In seeking to isolate the *M. gonorrhœæ*, a method I have found at once convenient and simple is the following: Two inoculations are made upon agar-agar slopes. One tube is inoculated with the secretion of the conjunctiva alone; the other is prepared for the growth of the micrococcus in blood. In my experience freshly-drawn blood is preferable. To obtain the necessary supply in the usual way by pricking one's own or another's finger or ear is a matter of time and uncertainty. Time is required to sterilize the part from which the blood is to be drawn, and there is uncertainty from the liability to accidental contamination of the extracted blood. I found another mode simpler and safer. With a piece of sterile wool the conjunctiva of the lower lid is gently cleansed of purulent secretion, and a patch of vascular conjunctiva is selected from which to collect material. A small vessel is pricked with a sterile needle, or the spot is rubbed with the platinum loop until the blood flows, and blood and surface epithelium and the residuum of secretion adhering to the part are mixed *in situ* and transferred to the agar slope. The first

tube inoculated with the secretion alone acts as a control. Early examination of the blood-culture after from twelve to fourteen hours' incubation at blood-heat, the discovery of minute slightly opaque colonies on the blood-smear hardly recognizable without a lens, which consist of cocci which do not stain with Gram's method and cannot be subcultured on to gelatine at a temperature of 22° C., together serve to determine the presence of the genuine *M. gonorrhœæ*.

The succeding schedule gives an analysis of the results of the bacteriological examination. Summarized, the results are as follows: In all twelve cases of early purulent catarrh where a diagnosis of inoculation with the gonococcus was made from the characters of the inflammation, the diagnosis was justified. The organism was present in the film preparations in each case, and in eight cases the organism was isolated in cultures; in the others its isolation was uncertain, owing to the mixture of organisms in the cultures. In nearly every case many other organisms were present in addition: the staphylococci, mostly the white variety, seven times; the xerosis bacillus six times; the *B. urethræ* twice; sarcinæ twice; a violet streptothrix once; and an unidentified bacillus

Bacteriological Examination

Case No.	Diagnosis.	Age.	Date of Onset.	Any Treatment Previously.	Film Preparation.	Gonococcus.	Staphylococcus Pyogenes Albus.	Staphylococcus Pyogenes Aureus or Citreus.	B. Xerosis.	Koch-Weeks Bacillus.	M. Urethræ.	Sarcinæ.	Streptothrix.	Unidentified Bacillus.	Bacillus Coli.
19	O.N.	21 dys.	5th dy.	Ag, 2% 10 dys.	Typical gonorrhœal pus	—	+	–	+	–	+	–	...	...	...
20	,,	24 dys.	4th dy.	,, ,,	,, ,, ,,	+	–	–	+	–	–	+	...	...	...
27	,,	5 dys.	3rd dy.	—	,, ,, ,,	+	+	–	+	–	–	–	...	...	...
46	,,	7 dys.	,,	—	,, ,, ,,	+	–	–	+	–	–	–	...	...	...
68	,,	6 dys.	,,	—	,, ,, ,,	+	...	+	+	...	...	...	+	+	...
110	,,	10 dys.	,,	—	,, ,, ,,	+	+	–	+	...	...	...	...	...	...
145	,,	4 wks.	,,	Ag, 2% daily	,, ,, ,, (Fig. 4)	...	...	...	...	...	...	...	...	...	...
218	,,	6 dys.	3rd dy.	—	,, ,, ,,	+	+	...	...	...	...	...	...	...	...
225	,,	4 wks.	4th dy.	—	,, ,, ,,	...	...	...	...	...	...	...	...	...	...
231	,,	5 dys.	3rd dy.	—	,, ,, ,,	+	...	+	+	...	...	...	...	...	...
237	,,	5 wks.	5th dy.	Boric lotion	,, ,, ,,	...	+	...	...	...	...	...	...	...	...
238	,,	5 wks.	3rd dy.	,,	,, ,, ,,	+	...	..	+	...	...	+	...	...	...
6	O.N.?	7 wks.	5th dy.	,,	No organisms seen in pus	...	+	...	+	...	...	...	...	...	...
45	O.N.?	13 dys.	6th dy.	,,	No organisms seen in pus	...	+	...	+	+	...	...	...	...	+
163	O.N.?	7 wks.	3rd dy.	Ag, 2% once	Right lachrymal abscess; stinking pus	...	...	...	...	...	...	...	...	...	+
195	O.N.?	7 dys.	4th dy.	...	No organisms seen in pus	...	+	...	+	...	...	...	...	...	...

7	Kerato-malacia; post O.N.	4 wks.	4th dy.	Ag, 2% daily	Crowded with *B. xerosis*	...	...	...	+	...	...	...	...	...	...	
179	,,	3 wks	?	,, ,,	Crowded with *B. xerosis*	...	..	...	+	...	...	...	...	...	...	
			Duration.													
14	Muco-purulent conjunc-tivitis	6 mos.	1 wk.	Boric lotion	Cocci and Koch-Weeks bacillus seen	...	+	...	+	+	...	...	...	...	...	
212	,,	5 mos.	3 dys.	,,	Crowded with Koch-Weeks bacillus (Fig. 5)	...	...	...	...	+	...	...	...	...	...	
240	,, ? Pneu-mococcic	8 wks.	14 dys.	...	Pneumococci seen	...	...	...	...	...	...	...	...	...	...	
24	Catarrhal + abscess	8 mos.	7 dys.	...	Cocci and *B. xerosis*	...	...	+	+	...	+ ?	...	...	...	...	
104	Mem-branous	11 mos.	6 dys.	...	Cocci and ? diphtheria bacillus	...	...	+	Non-pathogenic diphtheria bacilli	...	...	...	...	...	...	
162	Nil	11 dys.	...	...	...	...	+	...	+	...	...	...	...	...	...	
215	Mem-branous	5 wks.	4 wks.	Ag, 2% 1 wk.	Muco-pus; some bacilli	...	...	...	Non-pathogenic diphtheria bacilli	...	...	...	...	...	...	
241	Nil	6 wks.	...	...	...	...	+	...	+	...	...	...	...	...	...	
230	? Pneu-mococcic	10 dys.	3 dys.	...	Stringy pus	...	+	...	+	...	...	...	...	...	...	

twice. In only one of these cases were cultures sterile, and in this case treatment had been applied by painting with a silver solution the previous day ; notwithstanding this, most characteristic film preparations were made from the discharge.

Some remark may be made on the fact that the gonococcus was only isolated eight times in twelve cases, where it was manifestly present in the film preparations and gave its characteristic staining reaction ; but the difficulty of cultivating the organism is such that the proportion is a very good one.

In the next group of four purulent cases, where the diagnosis was tentative only, the doubt of their production by the *M. gonorrhœæ* was justified by the bacteriological examination, for in no case could this organism be found, either in film preparations of the discharge or in cultures ; but some other organism capable of producing the clinical conditions was obtained in the cultures.

One of these cases was of particular interest. On the third day of life the left eye of a child was affected. The lids were swollen, and some puriform discharge escaped from between them. The inflammation subsided after one painting with silver nitrate, but relapsed on several

occasions. Then the right eye was affected, and on the seventh week, when I saw the child, there was a right lachrymal abscess, filled with stinking pus and swarming with *B. coli communis.*

In another case, not unlike the foregoing, except that no abscess was formed, the *B. coli communis* and the Koch-Weeks bacillus were isolated.

In two other cases of a mild purulent type, in single eyes only, the *S. pyogenes aureus* and the *S. pyogenes albus* in profuse culture were obtained, and were presumably the cause of the inflammation.

The two cases consecutive to ophthalmia neonatorum were both in a condition of keratomalacia and xerosis. In both the dry, curdy matter in the fornices was swarming with the xerosis bacillus, but no gonococci could be found.

The three purulent cases occurring in the second, fifth, and sixth months of life did not differ, except in severity, from cases so frequently met with in epidemics amongst adults. In fact, one infant was of a family the rest of whom showed typical muco-purulent catarrh of the type due to the Koch-Weeks bacillus, and in this case, in both infants and adults, this

organism was found. The same organism was the cause of the second case. In the third case, where a thick fibrinous and purulent discharge commenced at the age of six weeks, and was examined at the eighth week, the pneumococcus was recovered.

Of the six odd cases, two were membranous conjunctivitis. In each diphtheria bacilli, non-pathogenic to guinea-pigs, were found.

Two single-eye inflammations were of mild severity. One, from the fibrinous character of the discharge, was suspected to be due to the pneumococcus, but the hospital bacteriologist reported only *B. xerosis* and *S. pyogenes albus* present. In the other case there were two fair-sized abscesses in the skin of the upper lid of the affected eye. From the discharge what appeared to be the *M. urethræ* and the *B. xerosis* were isolated.

The two last cases—one a baby of eleven days, the other of six weeks—were pronounced to be perfectly healthy. No treatment was given, and they were as healthy when seen a week later. Yet from the conjunctivæ of these children good cultures of *S. pyogenes albus* and *aureus*, *Sarcina lutea*, and the *B. xerosis* were obtained.

The streptococcus which is known to produce

the most disastrous membranous forms of conjunctivitis in children, especially after attacks of measles and scarlet fever, was not found in any case. I have isolated it frequently in older children. One case, occurring at the age of seventeen days, has been published by Lawson.

The general lessons to be drawn from these clinical cases, in which the bacteriology was worked out, are, I think, fairly clear. Rarely is an ophthalmia, with profuse purulent discharge occurring in the early days of life anything other than an effect of the inoculation with the *M. gonorrhœæ*. Contrarily, mild affections occurring at this period — simple catarrhs, muco-purulent catarrh, even to purulent catarrh of mild degree, especially when single-eyed—are rarely due to the *M. gonorrhœæ*, but most often due to the invasion of the Koch-Weeks bacillus, the *B. coli*, the *M. urethræ*, or one of the pyogenic cocci.

These results of mine agree with most other similar collections published, but the evidence of them does not support the finding of Groenouw of Breslau, who published in 1900 the results of the examination of 100 cases of blenorrhœa and catarrh, and stated that in some cases of catarrh of mild order the gono-

coccus was found. One wonders whether there was not some possible confusion between the gonococcus and *M. urethræ.* They possess features in common which would lead to confusion in diagnosis from film preparations alone, but they are easily distinguished on cultivation.

TREATMENT

TREATMENT must be regulated according to the severity and danger of an attack. As we have seen, eyes attacked by ophthalmia the result of an inoculation with the gonococcus are in serious danger of injury to the cornea, even to loss of vision. These are the cases of first importance. The preparation of a stained specimen of the discharge for microscopic examination is the work of a few moments, and it is our first duty; for the presence or absence of the gonococcus must determine our action.

In all cases of inoculation with the gonococcus the child should be taken into hospital to ensure continuous and efficient treatment. Should a case come under our care with clear, undamaged corneæ, we ought to expect a complete cure in all but a fractional percentage of cases.

However good our treatment may be in its planning, it can only be really effective if its

carrying out is equally well arranged. To trust to a daily examination in the out-patient department of a hospital, and an interim care of the case by mother, nurse, or midwife, is to take a risk in which we are not justified. For the most part, the people amongst whom these cases occur are poor and ignorant, and the occurrence of the disease has already demonstrated some lack of care or knowledge on their own or their attendant's part. Of course the cases may be successfully treated as out-patients. All those that appear in my list were so treated, on account of lack of hospital accommodation, and the results were good, because it was possible to put each case in the charge of a student-dresser, who was made responsible for it. But with the best will we cannot make sure of such a case without continuous control. Besides, these are cases of contagious disease, and for the good of the community they should be withdrawn from a crowded tenement-house during their dangerous stage.

The treatment of the conjunctival sac resolves itself into two parts: washing and the application of some germicide. If there is any procedure which has impressed me more than another in the treatment of such cases, it is the benefit derivable from copious and gentle

washing; but it is not easy, in that it takes much time and trouble, and requires more than ordinary attention on the part of the helpers. In South Africa I had half a dozen troopers with fresh attacks of gonorrhœa contracted at the port at which we lay. No direct treatment was attempted, but their infected urethræ were washed from the bladder outwards by free micturition, induced by copious bland drinks and diuretics. The men were under absolute control; they were not permitted to move from their bunks, and they made record recoveries. If this can be done in the case of a part which cannot be got at, how much more in the conjunctiva, to which we can get access?

Promiscuous swabbing with silver lotions, without proper cleansing, is almost as bad as the masterly inactivity of Master Rowley, whose record I have quoted, and his pride in the manner in which he physicked the mother for the ophthalmia of her new-born babe, whilst he left the babe to take care of itself. Carelessly swabbing a conjunctiva welling up with pus is but adding another irritant to the already unhappy eye. No efficient solution ever gets to the conjunctiva: it is decomposed by the pus, and adds a myriad of minute foreign bodies to the stew.

The eye should be irrigated with a full but gentle stream of tepid boric or Condy's Fluid, so as to wash it as free as possible from infective material. And before the use of any silver solution it is as well to use a wash of a normal saline solution of sodium sulphate to rid the membrane of chlorides as far as possible.

The earlier practice of syringeing the eye has

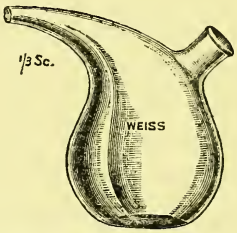


FIG. 6.—THE BEST FORM OF DOUCHE-BOTTLE WHEREWITH TO IRRIGATE THE EYES. (ONE-THIRD SIZE.)

The bottle varies from the usual pattern by having a short snub snout.

been rightly discarded, it endangered both the patient and the attendants; but washing with a Schuster's drop-bottle (the 'Undine' of Moorfields Hospital) of 100 c.c. capacity is perfectly safe to patient and attendant. The lotion flows as a limpid stream, and is not under pressure, so there is no danger of splash. By no possibility can a careless nurse project a forceful stream, and the shape of the bottle is

such that there is no temptation to bring the blunt end of the spout between the lids.

After the wash the chosen germicide should be swabbed into the fornices and over the mucosa, avoiding the cornea as far as possible.

Since the discovery of Saint Yves, in 1722, of the value of silver nitrate for all forms of conjunctivitis, preparations of silver have held the field—not because many reagents have not been tried: there is scarcely one active



FIG. 7.—TAPER-ENDED GLASS-ROD WITH COTTON-WOOL SWAB TWISTED THEREON. (FULL SIZE.)

As used for applying watery solutions to the conjunctiva at Moorfields and elsewhere.

germicide that at some time or other has not been considered to be of exceptional utility. Just now the conflict is between the various forms of silver salts. Numerous 'colloidal' preparations have been put upon the market by able chemical manufacturers, and each has found enthusiastic users.

I have had considerable experience of three of these: protargol, collargol, and argyrol. The last two I used systematically for six months comparing them with the nitrate in treating various forms of conjunctivitis, using the nitrate for one eye and a colloidal pre-

paration for the other. I did not find them of use. Protargol I used over a much longer period, and still use to some extent, for it is distinctly better than either of the other two named. I do not find it as good as the nitrate, even when used in a solution of twenty times the strength of that of the nitrate, but it has the advantage of being much less painful. In some few cases the eye treated with protargol recovered more speedily, but the difference was not more than an accident of unequal affection might determine. But the nitrate has always seemed the more satisfactory for rapidity of effect and certainty of action. I have used the nitrate in solutions of 0·5, 1, and 2 per cent., according to the severity of the case and the frequency of application. For some time I have had solutions prepared with 20 per cent. of glycerine in distilled water. The addition diminishes the irritation of the pigment, and appears to increase the penetrating power of the silver salt; for the glycerine is hygroscopic and produces an interchange of fluids within and without the cells.

Recently the Therapeutic Committee of the British Medical Association published the results of a most valuable research into the relative value of preparations of silver. Fifteen

were examined, and the bactericidal power, the antiseptic action, and diffusion properties of each determined for solutions made up to contain a definite percentage of silver.

The experiments show that of those preparations that are powerfully bactericidal, silver nitrate, silver fluoride, actol, itrol, argentamine, argentol, albargin, argonin, ichthargan, largin, novargan, and protargol were closely similar in power when made up in solutions containing equal percentages of residual silver. Since silver fluoride and nitrate contain in any given strength of solution more silver than any other of these preparations, and are much cheaper and easier to prepare than any of the proprietary preparations, the simple salts have a great advantage. Silver nitrate has one serious disadvantage—that of being irritating and painful of application. This effect appears to be due to free acid, and it varies with the care exercised in preparing the salt. Also, as I have shown, the irritation of the salt can be reduced by use of glycerine as an excipient.

In cases where only one eye is at first affected the most scrupulous cleanliness should be observed to prevent the communication of the infection to the sound eye. This cannot be done, as in an adult, by covering the eye

with a Buller's shield or similar device: we must rely on cleanliness, and keeping the child in such a position in the cot as will ensure the draining of the purulent fluid away from the sound eye. In these cases I have always adopted the practice of ordering a totally separate bottle of lotion of 1 in 5,000 of perchloride of mercury to be applied to the sound eye twice a day, the lotion to be dropped in between the eyelids, and the skin of that side of the face to be carefully washed with the lotion and then dried.

The duration of the discharging stage of the cases is long. Cases occurring at the old Belgrave Hospital for Children during a period of ten years were in attendance at the hospital for an average of 9·16 weeks. All these were treated as out-patients. If we could always take these children into hospital, and institute a regular and effective régime of irrigation, as well as the use of a germicide, they would not last so long a time as this.

Some workers have thought the shortening of the case could be effected by using stronger antiseptic applications. Thus Schalscha of Berlin puts forward a plea for the use of silver nitrate of a strength of from 3 to 4 per cent., instead of the usual 1 to 2 per cent. He bases

his plea on the evidence of an accidental application of a 20 per cent. solution in such a case owing to a mistake by a dispenser. He writes: 'Two or three drops were instilled. In fifteen minutes the skin was black, and the lids so œdematous they could not be opened; there was a sanguineous exudate. When the lids were opened with retractors, the cornea was seen to be white, as from a lime burn, and the conjunctiva was covered with a thick membrane. At the end of twenty-four hours the condition was rather worse, but from then it cleared, and recovery was rapid and complete. The cornea was intact and lustrous, and no symblepharon was produced. On the fourth day the ophthalmia had completely disappeared.'

On the other hand, Roth cites a case where the cornea was badly damaged by the use of a 10 per cent. solution, and Cant adds a similar warning from his observation of the use of strong solutions in the East.

On occasions I have used a 5 per cent. solution; it certainly increased the œdema, but it did not appear to shorten the total duration of the disease. My experience is that we best effect this by ensuring the efficient action of our germicide by properly washing the conjunctiva before painting it.

THE PREVENTION OF THE DISEASE

The words of Huxley which appear on the first of these pages—'The great end of life is not knowledge, but action'—seem to me to be a fitting summary of our relations as followers of the healing art to ophthalmia neonatorum.

We know all about the disease; we know all about the history of the struggle of our forefathers to know it. The names of those who, in years gone by, have added to our knowledge of it are part of our very vocabulary. The least ready of the students in any of our schools could give a fair account of its causes, and of the nature of the infection, and the risks to sight involved in it. Yet for us in England the great end of life has been knowledge; we have not attained unto action. Some action we have attained unto: the treatment of the disease has been put upon a sound and rational basis. There is scarcely any difference in our methods from one end of the country to another, but

the action to which all men of medicine look as the ultimate goal of their endeavours—*the prevention of the disease*—has not been reached.

Although in some parts of the country the disease is less frequent than formerly—as the figures collected from the Middlesex Hospital clinic show—yet for the country, as a whole, the census returns indicate an increase of blindness in early life.

The earliest recommendation for the prevention of the disease are to be found in the directions of Gibson (1807), which are as simple and direct as any that could be arranged now:

1. The leucorrhœa of the mother ought, if possible, to be cured during pregnancy.

2. When this has not been done, the noxious secretion ought to be removed from the vagina during delivery.

3. The infant's eyes ought, immediately after birth, to be cleansed with a fluid which either removes the noxious matter or is able to prevent its injurious effects.

Again, there is the emphatic passage in the text-book of Mackenzie, written in 1830, which I have already quoted, that 'the eyes of the infant should be carefully washed as soon as it is removed from the mother.'

These recommendations did not receive the

attention they deserved, because many were not convinced of the truth of the statement that the disease was almost always due to an inoculation of the child's eye with matter from the vagina of the mother. So Stellwag, writing in 1860, recommends, for the prevention of the disease, 'to keep the child away as far as possible from all dazzling light.' He recommends an even temperature and good ventilation as important before mentioning cleanliness, and he does not even hint at the necessity of cleansing the eyes of the child; indeed, he goes so far as to quote the opinion of Mackenzie, that the disease is produced by inoculation of the child's eyes during birth, and rejects it on the ground that the eyes of the child are closed during labour, and sealed with a covering of fatty material, which is impenetrable by the leucorrhœal fluids.

When the views of Gibson and of Mackenzie had been proved to be correct by the discovery of the *M. gonorrhœæ* by Neisser, in 1879, and the assurance from this fact that the discharges of both gonorrhœa and of purulent ophthalmia contained this same organism, it was a short step to the general introduction of regular practices of cleansing the passages of the mother and the eyes of the child, such

as had been recommended so many years before.

The name of Credé is particularly associated with the modern practice of prophylaxis. In his earliest publication he lays great stress on the necessity for the disinfection of the vagina, and the subsequent cleansing of the eyes of the child with an antiseptic solution. For this purpose he at first used borax.

Gradually attention became more concentrated upon the cleansing of the child's eyes, and experiments with various germicides were extensively carried out.

The possibility of destroying an invading organism was made certain by the experiments of Piringer, who showed that the pus from an acute case of the disease might be inoculated into the conjunctival sac without injury, provided it was well washed out with water not later than three minutes after the inoculation.

Carbolic acid was at this time the principal antiseptic, and so was largely employed in midwifery practice. The solution, however, had the disadvantage of causing a good deal of irritation. Salicylic acid and chlorine water were tried by others.

Not being satisfied with the borax solution, Credé used salicylic acid solution of 2 per cent.

for cleansing the eyes, and then instilled into the conjunctival sac one drop of silver nitrate solution of 2 per cent., and subsequently covered the eyes with a compress of salicylic acid for twenty-four hours. Later, he found all that was necessary was to wash the eyes with water and then instil the drop of silver nitrate.

The beneficial results of this procedure were immense. In Credé's clinic in Leipzig, prior to the use of this prophylaxis, the average incidence of the disease was 10·8 per cent.; after its use the incidence fell from 0·1 to 0·2 per cent. And wherever the method or any of its variations have been tried under similar conditions, the results have been equally good. There is not the least difficulty about the procedure in competent hands. When on my course of duty in the external midwifery department of the Middlesex Hospital, I invariably adopted the method, there was never any symptom of conjunctivitis, and in no case was objection made to the procedure by parent or nurse.

1. Prophylaxis.

The details of Credé's method of prophylaxis have been subject to much criticism, and there is a good deal of variation in the manner in

which it is employed. Many other germicides have been tried, such as permanganate of potash, finely-powdered iodoform, chinosol, formalin, the subchloride and the perchloride of mercury, and the various colloidal preparations of silver; but a simple silver salt remains the most used, for it has a selective action on the intercellular cement substance, and so destroys any organisms that may have penetrated into the conjunctiva. The nitrate is still the most used, but, according to Sinclair, the acetate is now used in Leipzig. The tendency is to use only a solution of the strength of 1 per cent. instead of 2 per cent., as formerly.

Returns from Private Practice in London.

Prophylaxis.—Cleansing after birth with boiled water or boracic acid; in a very few suspicious cases with perchloride of mercury or silver nitrate of dilute solution.

Births.	Purulent Cases.	Eyes Blinded or Injured.
9,680	70, or 0·72 %	4 cases

Routine use of 2 per cent. silver nitrate after cleansing with water.

Births.	Mild Purulent Cases.	Severe Purulent Cases.	Blinded or Injured.
3,000	37, or 1·2 %	3, or 0·1 %	2 cases

Hospital Extern Practice in London.

Prophylaxis.—Cleansing with perchloride of mercury 1 in 5,000, and in a few cases silver nitrate 2 per cent.

Births.	Catarrhs not Purulent.	Purulent Cases.	Blinded.
700	12, or 1·7 %	4, or 0·57 %	0
—	—	1 on tenth day	1 partly

There is a distinct body of evidence to show that the use of a silver solution, or, for that matter, any germicide of sufficiently powerful effect, is not always innocuous to infants. Any such reagent by its very nature is an irritant, and is liable to produce a transitory inflammation of the conjunctiva; and should such be

mistaken by an over-anxious attendant for an initial sign of ophthalmia neonatorum, the mischief is likely to be increased by a further use of the germicide. I have seen such cases, and a case where this effect was pronounced in a weakly and ill-developed child.

Pechin, in reviewing the methods of prophylaxis, went so far as to consider the use of a 2 or even 1 per cent. solution of silver nitrate was liable to cause, not only a conjunctivitis, but a slight scarring of the cornea, and so a diminution of visual acuity, perhaps even a subsequent squint. Few will agree with such a sweeping denunciation. More will echo what I have said, or the words of Groenouw of Breslau, who writes :

'Credé's method does not prevent the appearance of ophthalmia in every case without exception ; on the contrary, it seems not improbable that in some of the less severe catarrhs occurring after birth the inflammation is entirely due to the irritation produced by the silver salt.'

So far the adoption of prophylaxis by Credé's or other allied method in this country has been very partial. I have made inquiries amongst doctors who have large midwifery practices in both poor and better-class districts.

Author.	Before using Prophylaxis.			After using Prophylaxis.			
	No. of Infants.	Cases of Ophthalmia Neonatorum.	Per-centage.	Prophylactic Method.	No. of Infants.	Cases of Ophthalmia Neonatorum.	Per-centage.
Abegg	—	—	—	Cleansing with water	—	—	3
Shirmer ...	—	—	—	Dry cleansing	50	—	—
Bischoff ...	—	—	5·6	Salicylic acid	—	—	2·60
Olshausen ...	550	69	12·5	2% carbolic solution after cutting cord	137	12	8·80
Olshausen ...	—	—	—	2% carbolic solution before cutting cord	166	6	3·60
Krukenberg ...	1,266	92	7·3	2% carbolic solution before cutting cord	82	11	13·40
Konigstein ...	1,092	51	4·8	1% carbolic solution before cutting cord	1,541	21	1·40
Credé	2,897	314	10·8	2% nitrate of silver solution	1,160	1 to 2	0·1 to 0·2
Konigstein ...	—	—	—	„ „ „	1,250	9	0·70
Krukenberg ...	—	—	—	„ „ „	703	1	0·14
Felsenreich ...	1,887	82	4·3	2% nitrate of silver solution, first period	3,000	58	1·90
Felsenreich ...	—	—	—	2% nitrate of silver solution, second period	2,100	21	1·00
Russell-Simpson	—	—	11·76	2% nitrate of silver solution	—	—	5
Bayer	1,106	136	12·3	„ „ „	361	—	—
Middlesex Hospital outdoor midwifery practice	—	—	—	In most cases perchloride of mercury solution (1 in 5,000) in some 2% silver nitrate	700	4	0·57

I found they did not use the method: they found no necessity for it; but in every case there was no doubt about their care in seeing that the eyes of the infant were well washed immediately after birth. So far as can be ascertained, it appears that, although in private practice the routine use of a germicide after cleansing is rare, some method of prophylaxis—careful cleansing and the use of a germicide—is very largely adopted in lying-in institutions.

The cause of this divergence in practice is pretty obvious. The disease means, to most of us, an infection with the gonococcus. It is true there is a small percentage of mild purulent cases not due to this organism, but there are few familiar with them who cannot distinguish them at sight from the real purulent ophthalmia due to the gonococcus. Venereal disease in hospital practice is no uncommon thing, but he would have a poor idea of his race and country who supposed for a moment that the proportion of these cases in his clinic represented the proportion of venereal disease amongst the whole community. They no more represent the true proportion than do the curiosities in our pathological museums their true proportion amongst fatalities.

In the care of new-born children in lying-in

institutions there is the recognition that the risk of the child to septic infection is more than that of infection at birth; there is a risk proportional to the number of women and children in the hospital, for from each a careless attendant may carry sepsis—by fingers, or instrument, or linen. Measures for prophylaxis, whether they be in the form of the strictest cleanliness in every procedure, or in cleanliness plus some special intervention at certain points, are at the basis of the possibility of hospitals. The risks of infection increase with the gathering of cases no less with lying-in women than with the wounded in time of war, and strict asepsis, or antisepsis, alone makes hospitals possible. Under these circumstances the care of a woman and child in a lying-in hospital must of necessity be different to that required for the same two in their own homes. Vaginal douches, before and after delivery, are matters of routine in hospital; they are hardly ever given before labour in private practice, and only after labour when some condition indicates. So the particular necessity of a new-born child to special treatment, though fully warranted by the cumulation of sources of infection in a hospital, does not commend itself to the doctor in general practice. But there is another reason, which to a certain extent, holds

the hands of private doctors. They know very well that gonorrhœal infection is at the basis of the great majority of these cases, and they know their patients, perhaps, better than any one else can know a man and woman, and to them, with this knowledge, there is much less necessity for a routine use of a special germicide than would appear to the hospital doctor, who cannot know his patient so well, and who has also to consider the risk of cumulation of sources of infection.

It has been proposed that the method of Credé should be made compulsory by law. Recently the proposition was discussed by the Obstetrical Society, but no line of action was arrived at. Later there appeared in the *British Medical Journal* a strenuous protest from Sinclair. The objection was based on two grounds: (1) that the risk of the procedure outweighed its prospective advantages, seeing the incidence of such blindness was small; (2) that it was an unwarrantable stigma on the parents, and an interference with the liberty of the subject.

1. Amongst 40,000 children in the London County Council schools in East and West London whom I examined in 1903-6, I found only seven children with eyes damaged by

ophthalmia neonatorum. Amongst the 412,500 examined by my colleagues last year, only 46 showed damaged eyes probably the result of the disease, or a percentage of 0·0106; or if this number be raised to represent the proportion amongst the total elementary school population of London, and the number in the blind schools taken in, there is only a total of 180 cases for 790,000 children, or 0·0226 per cent. These figures are small, but they represent an immense amount of disability and suffering.

The necessity for Credé's method of prophylaxis, as I have shown, does not commend itself to the general practitioner, for to him ophthalmia neonatorum is a rare disease.

2. There is also a reasonable objection, on the ground of sentiment, to any legal enforcement of the method of Credé. The disease is not like small-pox, to which all unprotected, clean and dirty, moral and immoral, are liable; there is a stigma attached to it amongst those who discover its cause. The legal establishment of a prophylaxis would at once dispel any ignorance as to the nature of the contagion intended to be combated, and the vast majority would strenuously resist a measure proposed for the safety of the few to the branding of all; the measure would be inoperative, and not only so—

the use of the method as at the present time would be stopped. To-day it depends only upon the tact and manner of the doctor whether or no he is allowed to so treat the baby's eyes if he thinks fit. With a widespread knowledge, such as would follow attempts at legislation, he would hardly dare do this. The doctor who tactfully uses the method amongst his patients does far more to spread the use of the precaution than any appeals for legislation will, for the gossip of ignorance is as likely to put it in the position of an expected 'rite' attendant on the solemnities of birth as the ingenious mischievousness of old hags who practise the rite of 'dispelling the witches' milk.'

In 1892 a special committee of the American Ophthalmological Society presented a report calling for legislation for the compulsory use of prophylaxis in alms-houses and State institutions, and recommended the routine use of silver nitrate, in 2 per cent. solution, with all newly-born children. But there was also presented a strong minority report in which disapproval of compulsory legislation was expressed. It asserted there was not sufficient data of the frequency of such blindness in the United States; that statistics of other countries, especially Germany, are of doubtful value or positively misleading; and

that most was to be done to prevent blindness by the accumulation and dissemination of exact knowledge regarding it.

Is there, then, nothing to be done to check the disease? It occurs in just those people who are most ignorant, most easily lulled into security by the wisdom of the old women, and least likely to spend the time and trouble attendant on a visit to hospital.

2. Notification.

Compulsory notification of all cases has been suggested as the best means of controlling the disease. The idea is an excellent one. The manner of attacking a disease is not new and unfamiliar. It has the advantage of custom and use. Some diseases must be notified at all times; others are added or removed from the list as occasion and epidemics suggest. The Infectious Disease (Notification) Act, 1889, has worked with conspicuous success in the case of those diseases scheduled under the Act, but the ophthalmia of the new-born is not amongst them.

Notification of a disease is one of the first requisites to our knowing what is the true incidence of the disease. The tale of the results

of it we know, but the number of cases from which these cases arise we do not know as a whole. So those who look to the compulsory use of a germicide must urge the necessity for this notification as a preliminary to their demands.

The advantages to be derived from notification can be well illustrated by the following :

Amongst 59 cases of ophthalmia neonatorum of which I have detailed notes, 22 were cases of some standing—from three weeks and more —the remaining 37 cases were of recent origin. Of these 22 old cases, 18 came to the hospital with one or both corneæ permanently damaged, in nearly all cases by perforating ulcers, so that in these cases there was a very heavy injury rate of 83 per cent. Of the 37 cases seen and treated at an early stage, only 1 suffered any permanent injury, and in this instance the parents lived twenty miles from the hospital, and failed to bring the child for attention.

Now, if all these 59 cases had been brought in the early stage of the disease, it is reasonable to suppose that in all, treatment would have been followed by equally successful results.

It is for this reason that we desire compulsory notification. The treatment of the disease

is urgent, and it is successful in proportion to the stage at which treatment is begun.

But, it will be urged, this is not prevention—it is only securing the advantage of treatment under favourable conditions. That is true enough, but I look to notification as a likely—indeed, almost certain—means of stamping out the disease at its onset. When a doctor or midwife has to notify a mishap in his or her practice, there is a great stimulus to the exercise of the most scrupulous care in preventing the mishap, or in checking it at its slightest indication. We are still human, and rewards and punishments still have a subtle influence upon our action. I do not doubt that, with such a necessity in view, the examination of the condition of the vagina of a woman before childbirth, and the use of an antiseptic douche in case of suspects, would follow; there would be greater care in cleansing and noting the condition of the child's eyes at birth and on subsequent visits. The matter would not be left until some complaint of a defect was made by the parents or nurse—the doctor would himself examine the eyes on each occasion.

Compulsory notification would not be a novel procedure. It would be but the extension of present-day practice in regard to other infec-

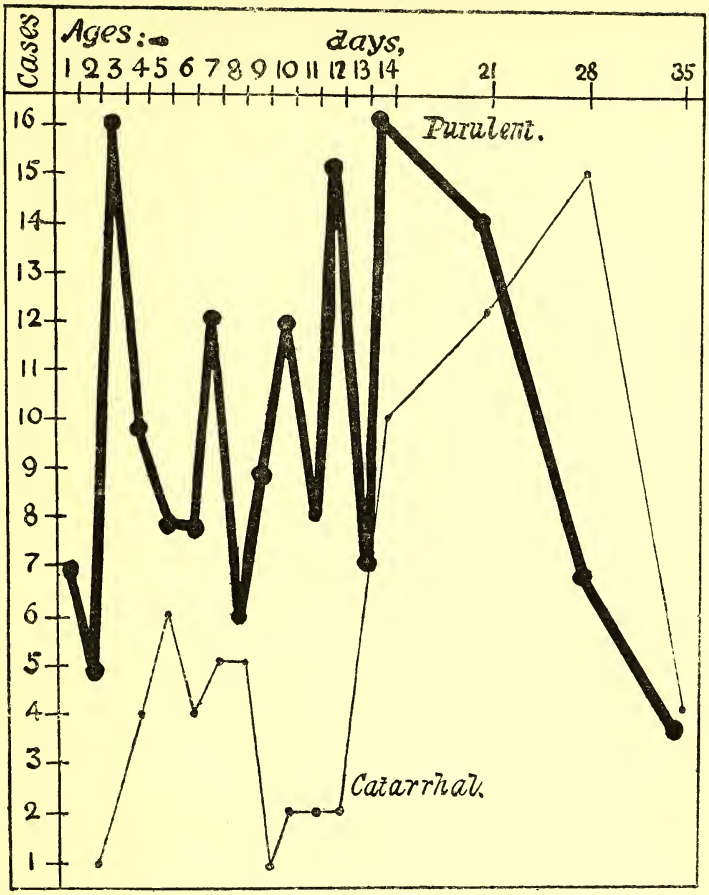


FIG. 8.—THE INCIDENCE OF PURULENT AND CATARRHAL CONJUNCTIVITIS IN INFANTS UNDER FIVE WEEKS (MIDDLESEX HOSPITAL).

Nearly all cases of ophthalmia of the new-born (purulent) commence within the first week of life. The chart shows that many more than half were not brought to hospital until the second week or later. It was amongst those who were not brought until a late stage of the disease that almost all of the damaged or blinded eyes occurred. Compulsory notification of the disease would secure the prevention of these disasters.

tious diseases, and I believe it would be found on all points to commend itself to the good sense of the community, and meet with the hearty support of the medical profession, be they supporters of compulsory prophylaxis or no.

Up till now the endeavours of the medical profession in this country to secure State aid in reducing the risks of ophthalmia neonatorum have not been successful. In June, 1884, the Ophthalmological Society, under the presidency of Mr. Jonathan Hutchinson, examined the report of their special committee on this matter. Evidence showed that in London, York and Hull, 30 to 40 per cent. of blindness arose from this one cause. A deputation, composed of the most influential members of this branch of medical work, waited on the President of the Local Government Board with the following plea:

'That, seeing purulent ophthalmia in the new-born was the cause of a vast amount of blindness, mainly because of the ignorance of the public regarding its dangerous character, and the consequent neglect to apply for timely aid, it is desirable to instruct those in charge of new-born children by card, in substance as follows:

'"If the child's eyelids become red and swollen, or begin to run with matter within a

few days after birth, it is to be taken without a day's delay to a doctor. The disease is very dangerous, and, if not treated at once, may destroy the sight of both the eyes."

'This is to be distributed through the medium of the Poor Law and Birth Registration organizations of the United Kingdom.'*

In January, 1885, the President of the Local Government Board replied that he could not issue cards as suggested. The issue would require payment to the registrars. Taking the cost at twopence each, it would mean £7,300 per annum, and it would be asked, If warning should be issued against one disease, why not against another?

An astonishing reply, truly! Cards at twopence each too costly to save the sight of one-third the children blinded! £7,300 worth more than the sight of 1,000 to 2,000 children!

I don't think any President of the Local Government Board would reply so now. He might criticize the proposal as a workable or

* On April 22, 1907, Lord R. Cecil introduced into the House of Commons a Bill to provide for the registration of births within forty-eight hours of birth. The Bill was well received by both sides of the House, and was read for the first time. If this Bill should pass into law, the recommendation of the Ophthalmological Society of 1884 would be a most practicable and useful scheme, from which much benefit would be derived.

useful scheme, but I doubt if he would balance the matter on a money basis in this fashion. In any case, his balance is a bad balance, for these blind cost the country directly, in the extra cost of blind schools, more than this sum each year, without counting the loss in the productive powers of the blind in adult years.

The efforts of the profession in other countries have been more fortunate.

In Prussia a book of rules was issued to all midwives as early as 1894, warning them of the danger of purulent vaginal discharge in the mother, and commanding them to invite a doctor to supervise such cases, or, if there should not be time, a vaginal douche should be used, and, after cleansing the baby's eyes, a drop of silver nitrate of 2 per cent. should be instilled. In Silesia it was made a punishable offence for a midwife to fail to report a case of purulent conjunctivitis, either verbally or in writing.

In New York, in 1902, the Board of Health declared ophthalmia neonatorum, both acute and chronic, to be a contagious disease, so physicians must report promptly to the Health Department; and, according to Lucien Howe, nine other States have adopted similar measures.

In France, by the law of June, 1903, ophthalmia neonatorum was made an epidemic disease, notifiable by the medical attendant.

Notification is not only a controlling measure, but it is of the highest educative value to the general public. It brings home to those most interested the seriousness which is attached to the disease by the authorities, and it is an infinitely preferable mode of education to such wild-cat schemes as that proposed by Fienzal of Havre—that a booklet with warnings of the dangers of the disease should be given to those registered as just married; or the even more appalling proposition of Cohn—that the dangers of the disease should be explained to children in schools!

In any efforts we make for the stamping out of disease we must work along lines that will commend themselves to the common sense of the community. That common sense will not only tolerate, but assist, in the enforcement of many restrictions upon individual liberty when such sacrifice is manifestly for the good of the community, but it will never tolerate the enforcement of any scheme of warning or prophylaxis which is manifestly an offence against the moral sense of the community. There have been a few conflicts of opinion between this

common moral sense of the community and medical opinion, and when the propositions of medicine have been manifestly a violation of this moral sense, they have always been rejected. It is well to recognize this, not only because we are wasting time and effort in attempting the impossible, but lest we be found fighting against a growth of public opinion which is doing the very work we are after. Vice and venereal disease are branded as infamous by this common moral sense of the community, and for this reason any scheme of warning or prophylaxis which presupposes a universal viciousness is repugnant, and never could succeed. It could only succeed by destroying that moral sense, which is the best preservative against rampant vice and our most valuable ally.

Notification offends the scruples of no one, not even those affected by the notification, if it be done decently. Besides, it would be welcomed by the general sense of self-preservation, for the disease is contagious and dangerous.

In former days any scheme of notification would have been impossible, for there was practically no control over midwives. With the establishment of control by the Midwives Act of 1902, the necessary connexion between the public health departments of the State and

the attendants of the newly-born child was made. Advantage should be taken of this facility. All midwives should be compelled to report any inflammation of the eyes of the new-born child, of whatever nature or degree, to a doctor. The doctor should be responsible for determining the condition of the child and for treatment; but in any case where there is a purulent discharge the case should be immediately notified to the proper health officer of the district.

Notification is no use unless there be some simple and efficient machinery for dealing with the cases. In the next pages I will put forward a plan which, I think, would meet the requirements of the situation.

3. Suggested Scheme.

Happily no fresh legislation is necessary to make ophthalmia neonatorum a disease which must be notified. Under the powers of the Infectious Disease (Notification) Act, 1889, every local authority is enabled to add to the list of diseases the occurrence of which must be notified to it, subject to the consent of the Local Government Board. This power has been fully used, and is increasingly taken

advantage of. Within recent years and months measles and cerebro-spinal meningitis have been dealt with under these powers. In London the County Council can act for the whole county, or any of the twenty-nine local authorities can act each for itself.

If good cause were shown and efficient pressure were brought to bear upon the London County Council, it does not seem unreasonable to suppose the Council would see the desirability of doing this much to reduce the incidence of a disease which costs them so much in the establishment and maintenance of schools for the blind.

If some important health authority were brought to view the situation in this light and to act upon it, there is no question other health authorities would follow suit. This has been the tendency in similar circumstances during the recent years of health administration.

The next concern is the machinery available for the treatment and oversight of the cases that may be notified. Here the difficulty is great, owing to the overlapping and lack of co-ordination of the many health authorities. The medical officer of health for a district cannot treat cases himself, nor can he depute assistants to do it for him—at least, not in

London. The costs would be disallowed by the audit. Yet it would appear that the local authority can appoint advisers or consultants who may be applied to in case of need, for this was done in the case of the recent concurrent epidemics of measles and small-pox. But if the medical officer of health cannot conduct treatment directly, he can influence it indirectly. He can require the certification by a medical man that the case is being so treated as will prevent its being a danger to the community; and failing that assurance, he could probably deal with the case as he would with a case of infectious fever—require the removal of the case to a hospital of the Metropolitan Asylums Board, and this Board in its turn would have to agree to receive such cases and make suitable arrangements for their reception. Ophthalmia neonatorum is contagious and dangerous. It does not kill, but it ruins lives.

In the case of midwives, it would probably be best to get control over their action in these cases through the Midwives Act of 1902. The powers given to the Board in the framing of rules for the conduct of the midwives are wide, and it would appear to be quite within their scope for the board to direct that the occurrence of ophthalmia in a new-born child

shall constitute the case one of dangerous labour, which must be immediately reported by the midwife, who must call in a doctor to take control of the case. Supposing this could be done, the same difficulty regarding the doctor to be called in would arise as has arisen in the working of the Act already. The midwife is bound to call in a doctor in a case of difficult labour, but no provision was made in the Act for the doctor or his payment. In Liverpool this difficulty has been overcome by the appointment of a salaried doctor, who may be called when required. So with the occurrence of ophthalmia in the new-born—most cases occur amongst the poor, who cannot afford to pay for a doctor; so whom should the midwife call in? Here is present need for some adjustment in this matter in case of midwifery. Liverpool can deal with it by arranging to pay for the services of a doctor, so there seems no reason why it cannot be done elsewhere. The adjustment of this difficulty should be our opportunity for the insistence upon the inclusion of cases of ophthalmia in infants within the scope of the duties of these appointments.

Briefly, we should aim at—

1. An exercise of the powers of local sanitary authorities under the Infectious Disease (Notifi-

cation) Act, 1889, to proclaim all cases of purulent ophthalmia occurring in children within twenty-one days of birth notifiable by the attendant in whose knowledge they come, under penalties provided in the Act.

2. An exercise of the powers of the Central Midwives Board in the construction of rules for midwives on their register so as to include in difficult labour (*a*) purulent vaginitis in the mother, (*b*) ophthalmia of any degree in the child, with the rule that a midwife shall be required to notify the case and call in a doctor.

3. The arrangement of such a plan as will enable the case to be promptly and efficiently treated, either by the private doctor, or by a doctor or doctors deputed by the Midwives Supervision Boards, or by a public hospital, or by the hospitals of the Metropolitan Asylums Board; and to aim that the cases should be taken into hospital for treatment, the mothers being provided for within the hospital for such time as necessary.

4. That the results of all such cases on the cessation of the disease should be notified to the medical officer of health for the district, for return to the Local Government Board, and subsequent publication with the returns of infectious diseases.

I believe the working out of such a scheme as this would result in the almost total extinction of blindness due to purulent ophthalmia at birth, both by ensuring the prompt and efficient treatment of all cases of the disease, and also by educating the public to a sense of the seriousness of the disease and their own responsibility in the matter.

CONCLUSION

In conclusion, I would urge the necessity for speedy action in this matter. With the extension of the Employers' Liability Acts, it will be increasingly difficult for the physically defective to obtain employment. Contracting out by employees is not permitted, and the risks of employers are proportionately increased when a workman suffers so grave a physical defect as that of blindness. The scope of useful and remunerative manual work for the blind of ordinary ability is not wide, and there is difficulty even now in meeting the need satisfactorily. With the risks of employers' liability pressing so heavily, the prospect of employment being found from philanthropic motives will steadily diminish, so that in some way or other the burden of the support of the blind will fall upon the State, either by the necessity for the provision of special workshops for them, or else by their drifting destitute and

helpless on the Poor Relief funds. Public opinion would scarcely tolerate this. If the State, by the extension of employers' liability, hinders the continuance of philanthropic effort which has been so successful in the past, the State will be compelled to take up the burden it has made impossible for private effort.

With such a prospect in view, it is indeed necessary for the State, if only from mere pecuniary motives, to do all in its power to prevent the occurrence of blindness which is preventable.

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